The New Zealand
# Journal of Agriculture.

VOL. 47. WELLINGTON, 20TH OCTOBER, 1933. No. 4.

## DAIRY-HERD TESTING IN NEW ZEALAND.

### REVIEW OF THE 1932–33 SEASON.

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THE ground lost in 1931–32, so far as dairy-herd testing in New Zealand is concerned, was more than regained in 1932–33, both from the point of view of number of cows tested and of average butterfat production per tested cow. During the past season 286,054 cows were systematically tested under one or other of the recognized herd-testing systems, this total representing an increase of 26,197 cows, or 10·08 per cent., over the 1931–32 total of 259,857 cows. The average butterfat yield per tested cow was 255·57 lb., an increase of 18·70 lb. over the 1931–32 average of 236·87 lb. butterfat.

The explanation of the marked rise in average production probably lies principally in climatic conditions. The dairying season of 1931–32 was marred by abnormal dryness in many dairying districts, and consequently was unfavourable to maximum milk and butterfat production, whereas the past season could be classed as better than the average, so that a comparatively poor season is being contrasted with a good one. An increased usage of fertilizers in the autumn and spring of 1932 must also have exerted some influence. The Government subsidy on the manufacture of superphosphate encouraged farmers to take advantage of the reduced price during this period; and although fertilizer usage fell off again in the late summer and autumn of 1933, this would not have affected production for the 1932–33 season. Another factor would be the improvement in dairy-farm methods arising from the necessity for more economic production of butterfat; nor must the educational influence of herd-testing itself be overlooked. An interesting point is that for several years there has been a heavy annual increase in the number of cows milked, the obvious result being a large proportion of first calvers. In view of this position one would have expected a retarded rather than an increased average yield, and the high standard of production is therefore all the more satisfactory. Last season's figure of 255·57 lb. butterfat is the highest yet reached in the history of herd-testing in New Zealand.

Statistics relating to dairy cows in milk and dry, and covering the past ten years, are given in Table 1. The two conspicuous features of

this table are, first, the steady increase in our dairy cow population, an increase of 526,852 cows in ten years, or 40·13 per cent.; and, second, the decrease in percentage of dry cows to total cows from 9·7 to 6·6. This latter tendency is especially desirable on account of its favourable influence on economy of butterfat production. It is interesting to recall that in 1910–11 there were 633,733 dairy cows in milk and dry in this Dominion, so that our dairy cow population has almost trebled in little more than twenty years. In the same period the percentage of cows in milk to total cows has decreased to considerably less than half.

*Table 1.—Dairy Cows in Milk and Dry as at 31st January of each Year.*

| Season. | Total Cows. | Cows in Milk. | Dry Cows. | Percentage of Dry Cows to Total. |
|---|---|---|---|---|
| 1923–24 .. .. | 1,312,589 | 1,184,977 | 127,612 | 9·7 |
| 1924–25 .. .. | 1,323,432 | 1,195,567 | 127,865 | 9·7 |
| 1925–26 .. .. | 1,303,856 | 1,181,441 | 122,415 | 9·4 |
| 1926–27 .. .. | 1,303,225 | 1,181,545 | 121,680 | 9·3 |
| 1927–28 .. .. | 1,352,398 | 1,242,729 | 109,669 | 8·1 |
| 1928–29 .. .. | 1,371,063 | 1,291,204 | 79,859 | 5·8 |
| 1929–30 .. .. | 1,441,410 | 1,389,541 | 51,869 | 3·6 |
| 1930–31 .. .. | 1,601,633 | 1,499,532 | 102,101 | 6·4 |
| 1931–32 .. .. | 1,702,070 | 1,582,664 | 119,406 | 7·0 |
| 1932–33 .. .. | 1,839,441* | 1,717,527* | 121,914* | 6·6 |

* Interim figures.

As previously stated, 286,054 cows were systematically tested during the season under review. This number represents 16·65 per cent. of the total cows in milk. Cows tested under the Group system numbered 259,881, or nearly 91 per cent. of the total; 25,364 cows were tested under the Association own-sample system; while the remaining 809 cows were tested by dairy companies on behalf of their suppliers. The particulars given in this review relate, needless to say, to the testing of ordinary dairy factory supply herds, and do not include cows tested under the Department's Certificate-of-Record and Official Herd Testing systems for registered purebred dairy cows.

Table 2 provides a numerical classification of tested cows according to land districts. The percentages of tested cows to total cows are also shown. The percentage figures for 1932–33 are based on interim returns only, the final statistics being not yet available, but only slight alterations, if any, are likely. The most noticeable feature of this table is the range of percentages, which run from 5·4 for Canterbury to 23·8 for Nelson. Although there is considerable room for advancement in all districts, the most disappointing position, having regard to relevant considerations, obtains in Otago, Southland, and Taranaki. Westland, it will be noted, has fallen back considerably, and it is unfortunate that this district was unable to maintain its strong position of the preceding year.

Table 3 is a summary indicating the number and size of the various organizations. To repeat the explanatory note embodied in previous reviews, the term "organization" denotes an individual unit; for example, an organization operating, say, ten groups is included as ten,

*Table 2.—Numbers of Cows tested Twice or more, and Percentages of Total Cows in Milk, classified according to Land Districts.*

| Land District. | 1928–29. | | 1929–30. | | 1930–31. | | 1931–32. | | 1932–33. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Cows tested. | Percentage of Total Cows in Milk. | Cows tested. | Percentage of Total Cows in Milk. | Cows tested. | Percentage of Total Cows in Milk. | Cows tested. | Percentage of Total Cows in Milk. | Cows tested. | Percentage of Total Cows in Milk. |
| North Auckland .. | 48,713 | 23·3 | 58,113 | 24·5 | 55,283 | 20·9 | 56,091 | 19·6 | 59,408 | 18·8 |
| Auckland .. .. | 106,823 | 28·2 | 109,811 | 26·8 | 102,534 | 22·6 | 99,806 | 20·6 | 111,517 | 21·1 |
| Gisborne .. .. | 9,579 | 29·0 | 12,329 | 33·4 | 10,418 | 25·0 | 9,145 | 20·4 | 10,634 | 19·9 |
| Hawke's Bay .. | 8,243 | 17·5 | 8,505 | 17·0 | 8,742 | 16·7 | 4,933 | 9·2 | 5,910 | 10·3 |
| Taranaki .. .. | 30,298 | 15·1 | 31,693 | 15·1 | 32,519 | 14·7 | 31,179 | 13·8 | 32,302 | 13·6 |
| Wellington .. | 36,547 | 19·6 | 42,224 | 21·1 | 35,875 | 16·7 | 30,569 | 13·6 | 34,992 | 14·6 |
| North Island .. | 240,203 | 22·8 | 262,675 | 23·0 | 245,371 | 19·7 | 231,723 | 17·6 | 254,763 | 17·8 |
| Nelson .. .. | 1,241 | 4·8 | 2,128 | 8·0 | 5,732 | 20·9 | 6,637 | 23·7 | 7,430 | 23·8 |
| Marlborough .. | 2,176 | 14·7 | 3,628 | 23·7 | 3,064 | 19·2 | 2,647 | 16·2 | 2,334 | 13·6 |
| Westland .. .. | .. | .. | .. | .. | 2,380 | 18·8 | 5,030 | 39·6 | 2,844 | 20·4 |
| Canterbury .. | 3,524 | 4·9 | 2,816 | 3·8 | 3,244 | 4·3 | 2,344 | 3·1 | 4,359 | 5·4 |
| Otago .. .. | 581 | 1·1 | 2,975 | 5·7 | 3,775 | 7·0 | 4,480 | 7·9 | 4,800 | 7·9 |
| Southland .. | 11,869 | 17·4 | 9,509 | 13·7 | 7,838 | 10·9 | 6,996 | 9·4 | 9,524 | 11·7 |
| South Island .. | 19,391 | 8·0 | 21,056 | 8·5 | 26,033 | 10·2 | 28,134 | 10·6 | 31,291 | 11·0 |
| Dominion .. | 259,594 | 20·1 | 283,731 | 20·4 | 271,404 | 18·0 | 259,857 | 16·4 | 286,054 | 16·6 |

NOTES.—" Total Cows in Milk " is at 31st January in each year. The 1932–33 percentages are calculated on interim figures.

not one. By an "effective" summary is meant that the table is compiled from individual summaries which appear sufficiently complete and reliable to justify inclusion.

On account of the small number of cows being tested under the Association system, this section of Table 3 calls for no special comment. Under the Group testing section it will be noted that there is a quite decided increase in the number of cows per head and of cows per group. This is a very desirable trend, having a favourable influence on both cost and efficiency of operation. It is also pleasing to note that the number of groups continues to increase.

*Table 3.—Number of Cows, Herds, and Organizations* represented in Effective Season's Summaries received. (Basis: All Cows in Milk 100 Days or over.)*

| | 1930–31. | 1931–32. | 1932–33. |
|---|---|---|---|
| *Group Testing.* | | | |
| Number of groups | 193 | 197 | 200 |
| Number of herds | 4,983 | 4,772 | 5,090 |
| Number of cows | 234,799 | 229,606 | 253,016 |
| Average number of herds per group | 25 | 24 | 25 |
| Average number of cows per herd | 47 | 48 | 50 |
| Average number of cows per group | 1,216 | 1,166 | 1,265 |
| *Association Testing.* | | | |
| Number of associations | 77 | 81 | 78 |
| Number of herds | 1,364 | 1,213 | 1,242 |
| Number of cows | 25,670 | 21,835 | 23,163 |
| Average number of herds per association | 18 | 15 | 16 |
| Average number of cows per herd | 18 | 18 | 19 |
| Average number of cows per association | 333 | 270 | 297 |

* Including both Group and Association systems, and on basis of sections or units.

Table 4 requires no comment other than that which has already been made with respect to increased average production. The average days in milk continues to increase, and is gradually approaching a more satisfactory level. The improved position would be due to better methods and to better cows, and the favourable influence of herd testing must be credited as one of the principal factors in this connection. Figures relating to 6,332 herds are included in this table, of which 5,090 were tested under the Group system and the remaining 1,242 under the Association own-sample test. The corresponding figures for 1931–32 were 5,985 total herds—4,772 Group and 1,213 Association.

Table 5 enables the butterfat production of tested cows to be studied according to land districts, and is self-explanatory. While Taranaki holds pride of place with the high butterfat average of 276·19 lb., this district only tested 13·6 per cent. of its total dairy cows in milk. Auckland's average of 254·67 lb. for 108,504 cows—21·1 per cent. of the total cows in milk in the district—is particularly creditable. Mention should also be made of Nelson's average of 269·27 lb., which is for 23·8 per cent. of that district's total cows in milk—in this respect the highest for the Dominion. However, there are so many influencing factors by way of climate, nature of farming, suitability of land, &c., that these comments can only be made in a general way, and are of little value without a detailed knowledge of the various districts.

*Table 4.—Grand Summary of all Effective Herd-testing Results on the Basis of all Cows in Milk 100 Days or over received for the Last Two Seasons.*

| | 1931–32. | | | 1932–33. | | |
|---|---|---|---|---|---|---|
| | Number of Cows. | Days in Milk. | Butterfat-production. | Number of Cows. | Days in Milk. | Butterfat-production. |
| | | | lb. | | | lb. |
| Average for all cows .. .. | 251,441 | 253 | 236·87 | 276,179 | 257 | 255·57 |
| Average for all Group cows .. | 229,606 | 256 | 238·11 | 253,016 | 259 | 256·86 |
| Average for all Association cows | 21,835 | 229 | 223·79 | 23,163 | 232 | 241·46 |
| Highest Group average .. | 437 | 265 | 294·27 | 403 | 260 | 318·61 |
| Lowest Group average .. | 539 | 243 | 185·52 | 688 | 249 | 204·23 |
| Highest Association average .. | 10 | 268 | 397·00 | 43 | 262 | 335·70 |
| Lowest Association average .. | 83 | 173 | 143·57 | 48 | 181 | 152·74 |
| Highest Group herd .. .. | 7 | 276 | 458·29 | 6 | 296 | 465·67 |
| Lowest Group herd .. .. | 39 | 131 | 56·54 | 3 | 128 | 71·33 |
| Highest Association herd .. | 5 | 329 | 478·99 | 31 | 315 | 488·15 |
| Lowest Association herd .. | 5 | 122 | 68·24 | 3 | 113 | 57·32 |
| Highest Group cow .. .. | .. | 337 | 909·00 | .. | 300 | 763·49 |
| Lowest Group cow .. .. | .. | 130 | 11·00 | .. | 111 | 7·00 |
| Highest Association cow .. | .. | 332 | 598·36 | .. | 245 | 645·00 |
| Lowest Association cow .. | .. | 107 | 28·20 | .. | 100 | 28·50 |
| Average daily production of butterfat for all Group cows | .. | .. | 0·93 | .. | .. | 0·99 |
| Average daily production of butterfat for all Association cows | .. | .. | 0·98 | .. | .. | 1·04 |

## GENERAL.

The New Zealand Herd Testing Central Executive has met on three occasions since last season's review was published, and, in addition to allocation of the Government subsidy to herd testing, has done much important work from the point of view of improvement of methods and standardization of practice. The work of the Executive has been particularly valuable in the matter of establishment of new groups and assistance toward strengthening weaker units. The policy of reimbursing newly formed groups for purchase of necessary testing outfit, &c., has been continued.

Mr. Dynes Fulton, who has been Chairman of the Central Executive since its inception some four years ago, has found it necessary owing to pressure of other duties to relinquish the position, and the vacancy has been filled by Mr. G. H. Bell, of Oakura. It is desired to place on record appreciation of Mr. Fulton's long and outstanding service to herd testing in New Zealand. Mention should also be made of the work done during the year by Mr. C. M. Hume, Federation Supervisor of Herd Testing. The sound position of many herd-testing organizations is due to the practical advice and assistance which, as the result of his long experience, Mr. Hume has been able to render.

The Government subsidy for the 1932–33 season amounted to £6,000, and will be distributed at an early date. The subsidy for the current season is set down at £5,000, and is to be reduced by £1,000 per season until it automatically expires. The Dairy Produce Board's grant made for last season was for one year only, and has not been renewed.

*Table 5.—Average Production, according to Land Districts, of all Cows under Herd-test for which Effective Seasons' Summaries were obtained. (Basis : 100 Days or over.)*

| Land District. | 1929–30. | | | 1930–31. | | | 1931–32. | | | 1932–33. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Cows in Summary. | Average Days in Milk. | Average Butterfat. | Cows in Summary. | Average Days in Milk. | Average Butterfat. | Cows in Summary. | Average Days in Milk. | Average Butterfat. | Cows in Summary. | Average Days in Milk. | Average Butterfat. |
| | | | lb. | | | lb. | | | lb. | | | lb. |
| North Auckland .. .. | 55,458 | 245 | 241·15 | 53,158 | 243 | 218·16 | 54,101 | 253 | 229·56 | 57,771 | 255 | 245·53 |
| Auckland .. .. | 106,549 | 256 | 260·27 | 99,042 | 253 | 243·95 | 97,218 | 260 | 233·61 | 108,504 | 264 | 254·67 |
| Gisborne .. .. | 11,606 | 236 | 234·62 | 9,899 | 235 | 225·13 | 8,853 | 250 | 242·29 | 10,265 | 251 | 254·73 |
| Hawke's Bay .. .. | 8,281 | 221 | 258·06 | 8,324 | 227 | 219·28 | 4,808 | 253 | 246·71 | 5,595 | 255 | 263·61 |
| Taranaki .. .. | 30,366 | 254 | 271·59 | 31,633 | 259 | 268·40 | 29,960 | 257 | 256·41 | 31,686 | 265 | 276·19 |
| Wellington .. .. | 40,343 | 242 | 246·80 | 34,152 | 248 | 252·29 | 29,215 | 244 | 226·03 | 32,012 | 253 | 255·61 |
| North Island .. | 252,603 | 249 | 254·03 | 236,208 | 249 | 240·97 | 224,155 | 256 | 235·32 | 245,833 | 260 | 255·62 |
| Nelson .. .. .. | 1,976 | 225 | 255·15 | 5,464 | 229 | 244·36 | 6,447 | 236 | 250·16 | 7,215 | 239 | 269·27 |
| Marlborough .. .. | 3,417 | 224 | 250·76 | 2,913 | 237 | 247·20 | 2,567 | 239 | 247·67 | 2,151 | 239 | 249·70 |
| Westland .. .. | .. | .. | .. | 2,321 | 229 | 234·54 | 4,902 | 232 | 241·59 | 2,816 | 236 | 260·89 |
| Canterbury .. .. | 2,506 | 206 | 237·65 | 2,627 | 212 | 220·57 | 2,155 | 219 | 226·67 | 4,129 | 223 | 233·38 |
| Otago .. .. .. | 2,790 | 227 | 244·41 | 3,535 | 228 | 237·94 | 4,319 | 236 | 252·03 | 4,685 | 238 | 249·02 |
| Southland .. .. | 9,262 | 227 | 249·92 | 7,401 | 231 | 249·47 | 6,896 | 237 | 261·26 | 9,350 | 235 | 256·32 |
| South Island .. | 19,951 | 224 | 248·27 | 24,261 | 229 | 241·81 | 27,286 | 234 | 249·63 | 30,346 | 235 | 255·11 |
| Dominion .. .. | 272,554 | 247 | 253·61 | 260,469 | 247 | 241·05 | 251,441 | 253 | 236·87 | 276,179 | 257 | 255·57 |

Thanks are once more expressed to officers in control of herd-testing organizations for having supplied the data necessary to compile the tables embodied in this review. The preparation of herd-testing statistics is a work of considerable magnitude, demanding great accuracy, and, moreover, is of a tedious nature. Persons concerned have almost without exception been prompt and courteous in their co-operation.

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# FARMERS' FIELD COMPETITIONS.

## THE NORTH TARANAKI ENSILAGE AND HAY CLASSES, SEASON 1932–33.

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JUDGING of the entries in the past season's ensilage and hay classes of the North Taranaki farmers' field competitions, organized by an executive representing the Farmers' Union and the Agricultural Society, was completed last month. Entries for the season were well maintained, the total in the classes under review being 314, as against 346 in 1931–32. This indicates that farmers as a whole regard the competitions as of definite practical value and a help to them in their farming practices.

Classes remained the same as in the previous season, and this classification appears quite satisfactory, although not altogether free from anomalies. The classes and entries (with the 1931–32 entries in parentheses) are as follows: Stack ensilage (grass), 101 (151); stack ensilage (other than grass), 7 (11); stack ensilage (hillside), 28 (32); concrete pit ensilage, 15 (16); earth pit ensilage, 46 (49); hay, 117 (87); total, 314 (346).

### (1) Ensilage.

#### THE RAW MATERIAL.

As indicated by the entries the bulk of the silage in North Taranaki is made from pasture, the quantity made from special crops being practically confined to one locality. In all probability these crops are being grown preparatory to permanent pasture, and it is doubtful whether high-standard pastures in this district would be ploughed merely to grow special crops for ensilage. The comparatively high points given for "raw material" in the competition indicates that Taranaki farmers are fully alive to the value of silage made from good pasture as compared with the value of that made from inferior growths. Some localities still adhere to the practice of making the best pasture growth into hay and conserving rubbish, thistles, &c., as silage, with the result that the silage compares poorly with the hay as a fodder for dairy stock. The making of weed growth and rubbish into silage, however, must not be altogether condemned, as it may still be quite good practice in that these undesirable growths are removed and stored as stock feed of a certain value; but this fodder should be fed only to store stock, and not to dairy stock, particularly those in milk. The points allocated for raw material may prove a little irksome

to some, particularly to those whose pastures show room for improvement, but it should be realized that the raw material plays a much bigger part in the making of good silage than the proportion of points would indicate.

### Stage of Cutting.

It is particularly gratifying to see pastures generally being cut at a younger stage, and the competitions have doubtless done much to bring this about. When a pasture is cut at a leafy stage silage making is a much simpler job than when the crop has gone past its best stage. Cut at the right stage waste will not be nearly so great, more risks can be taken in the way of weather, and a large proportion of first-class fodder must result.

The actual date of cutting does not really indicate very much; it is the stage of the crop that counts—in other words, the length of time between closing and cutting. The actual cutting may not take place until February or March, but if the paddock has been closed for only a few weeks the crop may be at an ideal stage. The aim in cutting should be to catch the crop at its maximum leafy stage. This may prove a little hard to estimate with some crops (for example, pasture containing much sweet vernal, &c.), but in the case of a good pasture with perennial rye dominating it should not be difficult to tell when the crop is ready. The rye-grass head will just be shooting, and the flag should be actually above the flower stalk.

It may be said that cutting at this stage is not good farm practice, as quantity is being sacrificed for quality. This is not so, as the growth from this stage onwards only increases the fibre content of the plant, with a definite lessening of the other contents, and while the crop may look higher the weight in most cases will actually be less. Another extremely important point in favour of early cutting is that it means a quicker and better aftermath growth, while the drain on soil fertility is also much lighter. If a dry season is experienced, this cutting earlier by seven to ten days may make a great difference to the state of the pasture during the summer and autumn months.

### Procedure in Cutting.

One thing that needs to be specially guarded against is in cutting the material too long a time before it is actually harvested, and this is particularly so when the crop has gone past its ideal stage. Frequently on account of insufficient horses it is necessary to cut the night before, and some of this material will not be harvested until the middle of the following day; in other words, it will have been wilted for eighteen to twenty hours. If the material is very leafy this may not matter much, but if it is already inclined to be dry when cut, or if a drying night-wind and a hot dry day are experienced, the material will have wilted too much when it reaches the stack and the temperature will reach too high a point, resulting in an inferior silage. If it is at all possible sufficient crop should be cut on the morning of harvesting to carry on until midday, while another cut can be made at noon for the afternoon's work. This applies only to pasture, as a little wilt with such succulent crops as lucerne and green oats may be an advantage. The position with the pit is different to that of the stack, and in most instances twenty-four hours' wilt for the first day's building proves

advantageous. Frequently the last foot or so in the bottom of the pit comes out too sour, and wilting of the first day's material would overcome this.

### Building the Stack.

The sooner the material can be brought in after being cut the better, as the great thing in making stack silage is to keep the temperature down. The ideal silage to aim at is the fruity green or slightly sour type which most resembles the growing crop. To get this the temperature need only reach 100° F. or a little more. Here again, early cutting is of great benefit, as is also immediate harvesting. It is also on account of keeping the temperature down that continuous building can be carried out. If the crop was leafy no harm will result in leaving the stack two days, but if the crop was ripe when cut continuous building is essential. With a ripe crop the adding of water or the liberal use of salt is often practised with beneficial results, but no artificial means can compensate for the natural sap lost through mismanagement.

In building, the centre should be kept full, but every attention also given to the walls to keep them firm and upright. Hard pulling or raking down at the completion of each day's building is strongly recommended and is time well spent. On completing the stack care should be taken that the full centre is maintained, so that any rain which gets through the soil covering will not penetrate the stack.

### Filling the Pit.

As already mentioned, a day's wilt of the material for the first day's filling is often advantageous, and indeed necessary if the crop is very succulent and no drainage is provided. Slow filling is also recommended, as the temperature rises more slowly in the pit than in the stack, while slow filling also means that more material will be got into the pit. If slow filling is to be practised an extra early start should be made on the crop, and this will also be an added advantage.

Just how the material should be placed in the pit appears to be an open question, although the competitions have shown that where the walls are perpendicular the centre should be kept very full. A few competitors with such pits reported that they built the reverse way (with a hollow centre) with good results, but where much wastage was found it was usually with the hollow centre filling. With sloping walls, however, the keeping of the centre full is not necessary; in fact, in some cases it caused a very definite drag which, while not causing undue waste, was not in the interests of easy emptying of the pit. One competitor filled his pit from the top—that is, at no stage was there actually any one in the pit. The material was pitched evenly over the rising surface from the top. The reduction of waste was almost ideal in this case.

The doorways of the pits still cause most of what little waste there is, and numerous methods were tried to reduce or eliminate this, but with no avail. Earth pits have proved quite successful, and the only advantage the concrete or plastered pit has over the earth pit is permanence. The first season or two the earth pit is all right, but as the walls begin to weather air pockets are formed which cause waste. Mice also often play havoc with the walls of earth pits.

### Covering the Stack.

Soil was used for covering in practically every case, and the depth of soil varied from 3 in. to 36 in. The average depth was from 9 in. to 15 in., and this in most instances proved quite satisfactory. The actual depth of soil—or perhaps weight of soil would more aptly describe it—depends largely on the type of soil used and the time before the soil becomes saturated with water. Nine inches to 1 ft. of soil saturated with rain within a week would prove more efficient than, say, 3 ft. of dry soil. The stack of Mr. H. T. Paul, Okato, is worthy of mention in respect to topping. This stack was almost ideally topped off and covered, although if there was any one fault it was in the liberal depth of soil.

The holding of the soil well out on the edges is perhaps of more importance than the actual depth, and many, varied, and ingenious were the methods adopted to carry this out. The use of netting is gaining in favour, although many found to their sorrow that the netting and the wires holding the netting must be strong and not half rusted. Short heavy logs wired to a centre peg were used in one district with extremely good results. Poles, heavy boards on edge, and manure bags all had their users, with varied results. It appears that it is not so much what is used as the care with which it is used that counts; there were good and bad with all types. With the pit where there is a roof the use of concrete slabs or boulders is to be preferred to soil.

### Opening the Stack.

The common method of opening up one section and feeding this right to the ground is largely giving way to the uncovering of the whole top and the feeding down at one operation. This latter method should only be practised, however, where at least 3 in. of silage is being fed off the whole stack daily. As stacks are usually opened when feeding is fairly light it would not prove sound to uncover the whole top. The feeding of the waste to the stock is not recommended. There is no feeding value in this waste, although no doubt hungry cows will pick it over and devour some—to their detriment. The place for this waste is in the potato patch, in the root-crop field, or in the garden, and it should be carted there as each load accumulates.

### Feeding Silage to Stock.

This has presented no difficulties, on account of our system of pasture grazing, but care must be exercised to avoid any tainting of milk or cream. Such care really means common sense. In 160 cases competitors were able to supply details of their stacks, methods, &c., and in only one case was any taint trouble recorded, the other 159 not having had a single complaint from their dairy factories. Possible sources of taint are: (1) Having silage lying around the shed or milk stand; (2) overfeeding silage and having it lying round the paddocks; (3) keeping the milk in close proximity to the vehicle used for feeding silage out, or using the same vehicle to cart the milk without cleaning it down; (4) clothing, &c., permeated with silage odours used at milking time.

## Health of Stock on Silage.

Complaints have been made in certain quarters with regard to troubles experienced with cows fed on silage. With a view towards getting definite information on this point each competitor was asked if he had ever had stock troubles, and if so with what type of silage. Out of 160 replies seven had experienced some trouble. In three cases of digestive trouble dark to black ensilage was fed, while two had scouring, and two digestive trouble which may or may not have been due to silage. This incidence of disorders is not as great as it might have been had the 160 farmers been feeding their cows to the same extent on swedes, chou moellier, &c.

## Judging of Pits and Stacks.

A review of the points in judging shows very little difference between those allocated to the pits and the stacks respectively, and this has led some to suppose that the pit has no advantage over the stack. It should be explained that each entry is judged according to its shortcomings of the ideal in that particular class. For instance, 4 in. of waste would be considered ideal for a stack, and such a stack would gain high points under this heading; but 4 in. of waste in a pit would be most excessive, and such a pit would score few points. It may be asked why all are not judged according to total elimination of waste, but some districts have only one class for all ensilage entries, and to judge by the one standard would eliminate all stacks. One could safely say that, judging on the same standard, the pit would, on the average, score 10 to 15 points more than the stack, and these points would just about indicate the difference between them in farm practice.

## Grass Ensilage Stacks.

Of the 101 stack ensilage (grass) entries 48 gained over 90 points, and this indicates the high standard reached with this class. The Fertilizer Company Cup for stack ensilage was won by A. N. Mills, Cardiff, who gained 95 points. The material was from pasture seven years old, and was last top-dressed with ammoniated super at the rate of 4 cwt. per acre. The material was well balanced and cut at an ideal leafy stage early in December. The crop was not allowed to wilt, and the size of the stack, which was a square one, was 26 ft. by 9 ft. 6 in. high. The material was brought in with sweeps, and a height of about 6 ft. was reached the first day. An interesting point is that a two days' spell was then allowed, and this emphasizes the margin of safety that exists with a leafy crop. Had the crop gone past its right stage this two days' spell would have resulted in inferior silage at the bottom; but one of the impressive points of this stack was the wonderful consistency of the silage from the bottom right to the top. After the two days' spell the stack was completed in five consecutive days. The weather during the period of building was showery, and, provided too much rain is not experienced, this is an advantage rather than otherwise, as it ensures non-wilting of the green material. Eighteen inches of soil was put on straight away, and this was well held out by poles. The stack was opened in sections, which was the correct procedure with such a big stack.

Second place was filled by Mr. G. Mehrtens, Inglewood, who has once won this class and has always been among the first three or four. This consistency on the part of Mr. Mehrtens indicates that there is much more than luck in the making of ideal silage. This material was from thirty-year-old pasture, also top-dressed with ammoniated super at the rate of 3 cwt., and was cut on 2nd December. The stack was 24 ft. by 25 ft. and 11 ft. high. Five feet was built the first day and the remainder put on in four more consecutive days. Eighteen inches of soil was put on straight away and the soil held by poles. It is interesting to note the great height of these first two stacks.

Mr. H. T. Paul, Okato, filled third place with a round stack 36 ft. in diameter and 8 ft. high. This was from three-year-old pasture top-dressed with 4 cwt. of lime and super. It was harvested on 10th December and built in three consecutive days, being immediately topped up with 18 in. of soil and held out with short heavy logs.

### Stacks other than Grass.

There were only seven entries in this class, but they were all good. Five of them were in the Okato district, and there is no doubt that this locality makes wonderful oat silage. The crop is cut with a reaper and binder just as the grain is hardening, and when there is a large proportion of flag present, and the sheaves are stacked without the bands being cut, just in the same manner as a grain harvest sheaf stack, although the centre is not kept as high. The butts of the outside sheaves offer a good resistance to the weathering, which means only a small degree of waste, while they also leave a solid wall on which good cover can be built.

The championship in this class was won by Mr. H. T. Paul, Okato. The crop was cut on 10th January and put into a stack 35 ft. in diameter. Three feet went in on the first day, and the stack was finished in two more consecutive days. Eighteen inches of soil was put on straight away. Mr. S. J. Crosby and Mr. F. Goodin, both of Okato, tied for second place, each having oat stacks.

### Hillside Stacks.

There were twenty-eight entries in this class and twelve scored over 90 points. The Blyde Bros. Cup for the championship was won by Mr. H. J. Staveley, Oakura, with 93¾ points. This was from a pasture twenty years of age, last top-dressed with super at the rate of 5 cwt. per acre on 26th November, and cut at a nice leafy stage. Fifteen feet in height was reached the first day, and one day's spell allowed. It was then completed in two consecutive days, and 15 in. of soil was put on straight away. During the past winter Mr. Staveley fed his dairy stock entirely on silage, with splendid results.

Mr. W. J. Bridgman gained second place equal in the hillside class with material from a thirteen-year-old pasture top-dressed last with 3 cwt. of lime and super. The crop was cut in a leafy state during the first week in November, and was harvested in three consecutive days. Eighteen inches of soil was put on straight away. The other competitor gaining the same points was Mr. W. Summers, Tariki. This crop was cut on 12th December and put in during approximately ten days, with very little spelling.

### Concrete Pits.

The keenest ensilage class is in the concrete pits, and when one considers the advantages of this type of pit it is obvious that the entries must be of a high standard, always assuming that the quality of the raw material is right.

The championship cup was won by Mr. G. H. Bell, Oakura, and as this is Mr. Bell's third win he wins the cup outright. Originally the pasture that the material for this pit was harvested from was not of very high class, but surface sowing of rye-grass, &c., some two or three years ago improved the sward wonderfully. The pasture, which is nineteen years old, was cut on 10th November. The crop was at a particularly young leafy stage and was harvested without any wilting taking place. The stack was built in three consecutive days, the centre being kept high throughout, and 15 in. of soil was put on straight after filling. Mr. E. C. Locke, Hillsborough, and Mr. J. Cloke, Lepperton, tied for second place.

### Earth Pits.

Mr. A. R. Gudopp, Westown, and Mr. F. Bracegirdle, Kaimata, tied for first place in this class, and thus share the Clements Cup. As an indication of the slowness with which a pit may be filled, provided the raw material is right, and may yet come out ideal silage, the dates on which Mr. Gudopp worked on his pit may be cited. A start was made on 16th November, and filling was continued on the 18th, 19th, 21st, 23rd, 24th, 25th, 27th, 28th, and 30th of that month, and again on the 2nd, 3rd, 5th, 6th, 7th, 10th, 12th, 14th, 15th, and 16th December, just a little being added on most occasions. Soil was put on on the 17th and 18th December. The pasture used was, in the main, quite a young one, and was last top-dressed with 2 cwt. of super and 90 lb. of 30-per-cent. potash salts

### (2) Hay.

This was a particularly strong class in entries, and some really good hay was seen. The average, however, was just Taranaki hay—wet a little, dried a little, musty a little.

Mr. C. Mackinder, Huirangi, won the *Daily News* Cup. This hay was from the paddock which won the pasture championship two years ago, and the building of the stack was very fine indeed.

Mr. J. Smith, Tarata, filled second place. This hay was also composed of a wide variety of good grass saved in good condition.

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The *Taranaki Herald* Cup for most points in all classes was won by Mr. R. Weeden, of Pukearuhe, Urenui.

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*Subterranean Clover in Hawke's Bay.*—The Instructor in Agriculture at Hastings reports that in the Central Hawke's Bay districts, particularly in the belt where the country is of a light nature, the settlers have realized the value of subterranean clover, and that this year many pastures sown down included a good rating of subterranean clover seed in the mixture. In one instance the carrying capacity has been increased from one ewe per acre to three ewes per acre, and the lambs on this place were superior to those running on the ordinary grassland.

# LOSS OF VITALITY IN DAIRY STARTERS.

## A CHEESE FACTORY INVESTIGATION.

H. R. WHITEHEAD, Dairy Research Institute (N.Z.), Palmerston North, and L. WARDS, Rexdale Dairy Factory, Mangamaire.

ALL those interested in the manufacture of Cheddar cheese are familiar with the variations in vitality shown by the cultures of lactic streptococci which are used as "starters." In spite of the fact that the success of the cheesemaking process depends to a large extent on a normal development of acidity in the vat, and that owing to variation from day to day in the vitality of the starter the process is often disorganized, very little scientific investigation has been carried out in an attempt to discover the cause of the variations and to eliminate them. Hence the cheesemaker is still in the position of not knowing from day to day how his starter culture will behave in the vat. Sometimes he obtains by chance a starter which proves dependable for several months, but sooner or later he experiences trouble and passes through a period during which his make is necessarily irregular and unsatisfactory.

The following account deals with an investigation of starter trouble in a dairy factory, the results of which tend to show that on some occasions, at any rate, the starter culture itself is normal, but that where it is grown in certain milks it is sensitive to the conditions of propagation, and will rapidly fail unless it is treated in a specific manner.

In May of last year a starter culture ($H_2$) which had been maintained under daily subculture since September, 1931, in the Dairy Research Institute laboratory, was supplied to the Rexdale Cheese-factory. It worked there most satisfactorily for several months. The method of preparation of starter in the Rexdale Factory was as follows: The milk of a single supplier was run into a tinned-steel jacketed vat and pasteurized at 190–200° F. for about an hour by admission of steam to the vat jacket. The milk was then cooled to approximately 70° F. and transferred to sterilized 20-gallon cans. The milk in the cans was inoculated with starter culture saved from one of the cans set on the previous day, and the cans were then covered with cheese cloth and placed near the wall of the boiler-room with the object of preventing any marked fall in temperature during the night.

After several months under this treatment starter $H_2$ failed in the factory, and at intervals further cultures both of $H_2$ and of other cultures were sent from the laboratory. The usual experience with these cultures was that in the first generation in the factory they produced starters which were more active than one which was in daily use at the time, but that in the second or third generation they failed entirely. Sometimes, failure was so sudden that they failed to produce enough acid to clot the milk in the starter can. Throughout this period it is to be noted that a starter was in daily use at Rexdale Factory which, although not so active as could be wished, did not suffer the sudden failure which characterized cultures sent from the Institute. The milk used in the factory for the maintenance of the culture was not always the milk of the same supplier. Other milks were tried with no difference in result.

In February of this year a further sample of starter $H_2$ was taken to Rexdale, and experiments were begun on the spot with the object of throwing light on the phenomenon of sudden failure in activity. The previous experience was first confirmed. The culture was inoculated into a can of milk prepared in the usual way. The resulting starter was quite active in the vat the next day. On the succeeding day, however, the second generation of the starter, prepared by inoculation from can to can, failed entirely, the milk in the can being not even clotted. It seemed clear that so far as starter $H_2$ was concerned there was either some inhibitory influence in the milk or that the conditions of culture were in some way unsatisfactory.

An attempt was therefore made to simulate the conditions of culture which obtained in the laboratory, where the mother culture had retained its activity for more than twelve months. About 300 cc. of the milk used for the preparation of the bulk starter was taken in a 500 cc. conical flask. A cotton-wool plug was inserted in the neck of the flask, and the flask was immersed in water at about 200° F. for half an hour. The milk was then cooled to 70° F. and inoculated with a few drops of a mother culture of $H_2$ from the laboratory. The milk clotted normally when allowed to stand beside the starter cans in the factory. The preparation of the culture in the flask was now continued daily, each succeeding flask of milk being inoculated from the previous day's culture in the flask. The cultures in flasks continued to clot normally from day to day. Each day a can of starter milk was inoculated from the flask culture, and the resulting bulk starter was used in one vat. Under these conditions the starter continued to work in a satisfactory manner in the vat, and proved much more active than the starter which had been in use in the factory up to that time. While the experiments were in progress the latter starter failed entirely and was rejected. All the vats were then carried on with starter $H_2$ maintained in a small flask and sown daily into the starter cans.

In order to make quite sure that the difference in treatment was responsible for the now successful maintenance of $H_2$ in the Rexdale Factory, a series of trials was commenced. Of the three or four cans of starter prepared each day, all but one were inoculated with culture from the flask. The remaining can was inoculated with culture saved from the previous day's preparation in the same can. This procedure was continued until the starter failed, when the starter in the single can was rejected and the process recommenced, using culture from the flask as a starting-point. On three separate occasions within three weeks the starter carried from can to can failed in the second generation, whereas the starter carried daily from flask to cans retained its activity. This proved beyond all doubt that the conditions of maintenance had an overwhelming influence on activity of starter $H_2$. Unfortunately, the system of maintenance in milk prepared in a flask did not prove a complete solution of the problem. In about three weeks the culture weakened in power, although it did not fail suddenly. A fresh start was made with some mother culture of $H_2$ from the laboratory. This proved satisfactory for a fortnight, when it, too, suffered gradual loss in vitality. Then, since a starter had been found which would retain its power when maintained in the ordinary way in the factory, experiments were discontinued for a time.

Up to this point, therefore, the following conclusions could be drawn. Starter $H_2$, although of fairly constant activity in the mother culture in the laboratory, was adversely affected by some condition arising during preparation in the normal way in the Rexdale Factory. The adverse effect was manifested by sudden failure, usually in the second generation of growth in large cans of milk. The starter retained its activity for a much longer period when it was maintained in the factory in a small flask of milk and used in the vats only in the first generation of its growth in cans. Even under these conditions it ultimately suffered a loss in vitality, although the same starter maintained under similar conditions in the Institute laboratory (except that here the milk was skimmed) retained and still does retain its activity. (In this connection it is just possible that the temperature of incubation of the mother cultures played a part. Whereas in the Institute laboratory the mother cultures are kept in an incubator which is maintained at a reasonably constant temperature (68°–72° F.), the culture in the flask at Rexdale could not be kept at such a constant temperature owing to lack of facilities. This feature of the maintenance of starters in factories needs attention.)

It seems definite in this instance, therefore, that the exact treatment to which the milk is subjected during the pasteurizing and cooling period prior to the inoculation of the starter is of prime importance, and is a deciding factor in the retention of activity. This confirms other indications which have been obtained in the course of work on starters at the Institute. Knowledge on the matter is very superficial at present, and it is impossible to define the exact conditions which need to be observed; variations in treatment which are apparently insignificant seem to make enormous differences in the growth of the starter. It has been found, however, that the most satisfactory results are obtained when mother cultures of starters are maintained in milk which has been pasteurized, cooled, and inoculated with as little agitation as possible in narrow-necked flasks plugged with cotton-wool.

There appears, moreover, to be a second factor. The maintenance of these rigid conditions seems strictly necessary only with certain samples of milk. For instance, the failure in activity experienced at Rexdale when the starter was transferred from can to can could not be reproduced at the Institute under apparently similar conditions but with another supply of milk. A similar phenomenon has in the past been observed at the Institute, but only during certain periods. It should be noted also that even at Rexdale on a previous occasion the same starter transferred daily from can to can had been used successfully for several months.

These considerations indicate that when milk is peculiar in some respect unknown at present the ordinary procedure of pasteurization and cooling, with constant stirring in large open vessels, produces a medium which has an adverse influence on certain starter bacteria within two or three generations. The difficulty can evidently be circumvented by pasteurizing and cooling the milk without agitation in small closed vessels. The precise differences represented by this change in treatment cannot be defined at present. There is, however, an additional advantage to be gained by the use of this method. It is much more easy to avoid contamination of a culture when it is maintained

in a small bulk of milk in a narrow-mouthed vessel. There is therefore everything to recommend such a method, even where trouble such as that experienced at Rexdale is not in evidence for the time being.

It is not suggested that the carrying of mother cultures in flasks will eliminate all trouble with starters. Only by experience in the field can it be determined to what extent the phenomenon observed at Rexdale accounts for failures of starter cultures. It is probable that there are many other factors which influence the activity of starters, and the elucidation of these will take a considerable time. But by extracting the utmost information to be gained from phenomena occurring spontaneously in the field we can confidently look forward to the possibility of a much closer control on starter activity.

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# SOME RECENTLY RECORDED EXOTIC INSECT PESTS.

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THE following article deals with four exotic insect pests which have recently appeared in New Zealand. Its purpose is to put on record the history of the appearance of these insects, and to give brief descriptions of them by which they may be recognized, together with notes on their life histories, habits, and control as far as can be ascertained from a study of the related literature. The four insects concerned are *Listroderes costirostris* Gyll. (obliquus) (=*Desiantha nociva* Lea), a weevil; *Psila rosæ* Fab., a fly; and two scale insects, *Ceroplastes rusci* Linn. and *Ceroplastes rubens* Mask.

## Listroderes costirostris (Weevil).

*L. costirostris* (Fig. 1), referred to as "tomato weevil" in Australia and "vegetable weevil" in the United States of America is another of the exotic pests to be added to the growing list of injurious insects which are gradually finding their way into and becoming established in this country. According to Lovell (1932) it is a South American species, and was first described from specimens collected in southern Brazil; he mentions that it was reported in Australia in 1908, and has since been reported in South Africa and the United States, in which latter country it was first recorded in 1922. How long it has been in New Zealand it is difficult to say, but no doubt it has been established here for some time, as over the past two years specimens have been received from widely separated localities such as Auckland, Gisborne, and Hastings.

### THE DIFFERENT STAGES.

The egg, when first deposited, is white, spherical, and about $\frac{1}{25}$ in. in diameter. As this egg grows older the colour becomes dark yellow, and at the time of hatching it is almost black. Egg-laying takes place from about mid-March to mid-September, though during the coldest months it almost ceases. The female prefers laying in moist places, and may lay 1 to 30 eggs per day, or

300 to 1,500 in a season. Oviposition in carrots and turnips usually takes place on the crown of the plants, though eggs may be laid on the petioles of the leaves or in the soil near the bases of the plants.

The larva is a legless grub. At the time of hatching it is creamy white in colour and about $\frac{1}{16}$ in. in length. The adult grub, which measures approximately $\frac{7}{16}$ in. in length, has a small dark head, immediately behind which is a small chitinized plate, the prothoracic shield. The body is broad anteriorly, tapering to a blunt end posteriorly, and is light green in colour.

The mature larva enters the ground and forms an earthen cell 1 in. to 2 in. beneath the surface, where, after a short prepupal or resting stage, a final moult occurs and the true pupa is formed. The pupa is about $\frac{5}{16}$ in. in length and a little over half as wide. The head is white, the wing pads yellow, and the abdominal segments green. It is very delicate, only the slightest pressure being required to rupture the body-wall and cause death. The length of this stage is largely influenced by climatic conditions.

FIG. 1. ADULT OF LISTRODERES COSTIROSTRIS. × ABOUT 6.
[*From Lovell.*

The adult, following transformation from the pupal stage, remains for a short time in the earthen cell, after which period it emerges from the soil to seek food. It is about $\frac{5}{16}$ in. in length and about half as wide. It is a typical weevil, with a prominent short stout rostrum or beak bearing elbowed and clubbed antennæ. It varies in colour from light to dark green and almost black. The wing cases are scaly and ribbed, with rows of short dark and light coloured hairs growing on the ridges.

## Life History.

As previously mentioned, egg-laying takes place from about mid-March to mid-September, and consequently the larvæ resulting are active during the autumn, winter, and spring months. Following pupation, adults commence to emerge about September and October. The freshly emerged adults commence feeding for a short while, but during the warmer months of summer and early autumn

æstivation (a resting stage or dormant period) takes place. Following this æstivation period the adults resume their activities and egg-laying takes place.

## Habits and Injury.

The weevils are gregarious and slow moving. They reproduce parthenogenetically. They are nocturnal feeders, and hide during the daytime about the bases of the host plant or under nearby clods and rubbish. They have well-developed wings, but they have never been observed in flight, though Lewis and others (1928) state that there is evidence that a dispersal flight takes place. The most likely method of their widespread dissemination is by the agency of man through their carriage from place to place on host plants.

FIG. 2. SHOWING CARROT-LEAVES INJURED BY THE WEEVIL.
[*Photo. by H. Drake.*

The principal injury is stunting of the plants, caused by the destruction of tender young crown leaves which are eaten away. The preferred larval food plants are carrots and turnips. In the case of attacks on the former host, only the large stems and heavy veins of the leaves are left (Fig. 2), while in severe attacks only the roots are left; whereas attacks on the latter host cause the destruction of the leaf surface and the gouging-out of the turnip bulb at ground level. The adult weevils, instead of using carrots and turnips as their principal food-supply, prefer young tomato and potato plants. As does the cutworm, they eat through the stems of these plants at the ground surface, but when the plants are more mature they ascend the stems and eat the leaves or cut the stems just below the bud.

Other hosts which have been recorded in addition to those referred to include spinach, radishes, parsnips, celery, parsley, broccoli, cauliflower, cabbage, kale, kohl rabi, lettuce, onions, leeks, and leaves of artichokes. Gurney (1932) mentions that the weevil breeds in many weeds, Cape weed and marsh mallow being particularly favoured.

### Control.

Thorough cultivation of the soil, especially during late winter and in spring when the weevils are passing through the pupal stage, the removal and destruction of refuse, and the keeping-down of weeds and grasses which afford shelter for the resting adults during summer are helpful in destroying large numbers of the pest. Again, crop-rotation methods are useful checks. As an example, it would be most unwise to follow a carrot crop with potatoes in the same field, or one adjacent to where carrots had suffered from the pest, for such a practice would almost certainly increase the weevil population at the expense and possible destruction of the potato crop. In such an instance the crop following carrots should be one other than that referred to in the host list.

Other methods of dealing with the pest include the use of poison baits, and spraying or dusting treatments. A suitable bait suggested by Lewis is composed of one part of sugar and one part of calcium arsenate to six parts of bran, with sufficient water added to make a crumbly mash. This bait should be broadcast in the evenings at the rate of 75 lb. per acre. For the control of the weevil on potatoes and tomatoes, Gurney has recommended spraying them with 1 lb. of lead arsenate powder (or 1½ lb. of the paste form) to 16 gallons of water. The chief objection to the use of lead arsenate is the fact that it is toxic to human beings, and Lovell on this account recommends dusting with either sodium or barium fluosilicate. Of the two, barium fluosilicate, though dearer and slower acting than sodium fluosilicate, is the most suitable to use on account of the fact that it is less injurious to foliage. It is best used at the rate of 70 to 80 per cent. strength, the remaining 20 or 30 per cent. of the dust being diatomaceous earth used simply as a carrier. It should be applied at the rate of 20 to 40 lb. per acre, depending on the density of the foliage to be dusted. (These fluosilicates are less poisonous to humans than are arsenicals.)

## Psila rosæ (Carrot-rust Fly).

The carrot-rust fly is popularly so-called owing to the characteristic rusty burrows it makes when feeding on the roots of carrots. Although carrots are the preferred host, parsnips, parsley, celery, and turnips are also attacked.

*Psila rosæ* (Fig. 3*a*) is a small, shining black, fly-like insect about $\frac{1}{6}$ in. long, with pale lemon-yellow legs and iridescent wings. The head is rust coloured, with red eyes. The first and only record the writer has of its presence in New Zealand comes from Auckland. Specimens of carrots infested with the maggots were received here in August, 1931, and from this material an adult fly was reared which was subsequently identified as *P. rosæ*. Though it may take years for the full effects of the depredations of this insect to be felt, there is good reason to be on the alert for its appearance, as it is one of the most serious of carrot pests.

## Life History.

The life history of the fly in Britain and the United States of America is broadly similar, and there is every reason to suppose, therefore, that the salient features under New Zealand conditions will be broadly similar to those of its life history in the Northern Hemisphere.

The adult insect deposits its eggs in the soil near the young carrot plants, and sometimes on the leaves of the seedlings. From the egg, which hatches in six to twelve days, a tiny legless maggot emerges, similar in appearance to the small maggots found on fly-blown meat. This maggot makes its way to the root of the carrot and commences feeding, and as growth proceeds it works upwards in the outer layer of tissue, eating out irregular shaped grooves or tunnels which are characteristically rusty.

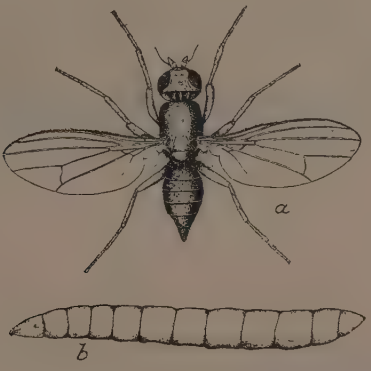


FIG. 3. ADULT (*a*) AND LARVA (*b*) OF PSILA ROSAE. × ABOUT 6.
[*After Greenhowe.*

The adult maggot (Fig. 3*b*), which is yellowish in colour, measures about ¼ in. in length, and when fully fed it pupates in the soil at varying depths. The time occupied in the larval stage is approximately one month.

## Seasonal Cycle.

The seasonal cycle of the fly varies in different localities. In Russia it has been found that there is one complete generation of the fly and a partial second. There the bulk of the first generation and a part of the second overwintered in the pupal stage, though some of the second generation did not pupate until the following spring. However, the adults from these latter emerged at the same time as did those from the overwintering pupæ. Greenhowe (1930) found in Scotland that there appeared to be at least two generations of flies in one season. In New York Glasgow and others (1929) recorded two main broods of the fly and a partial third. In the three localities mentioned the fly commences to emerge in late spring. In New Zealand in the northern portion we might expect two generations of the fly and a partial third, while probably two generations are the most that would occur in the southern portion.

### Injury and Control.

Small carrots may be killed by the cutting off of the feeding roots and by the entrance of fungous rots. More often, however, the plants are temporarily stunted and develop into bulbous, many-legged carrots. The leaves of affected plants wilt, turn yellow, and develop a characteristic reddish fringe which easily distinguishes them from healthy plants. In a slight attack growth is arrested and the roots are badly cankered, whereas in a severe attack the crop may be only fit for ploughing or digging in.

Numerous methods and practices for the control of the fly have been recommended, including screening, late sowing, the sowing of onions or shallots with carrots in the same drill, and soil treatment with materials such as bichloride of mercury, paraffin, naphthalene, tar compounds, sheep-dips, lime, salt, bordeaux, oil emulsion, and various proprietary compounds.

After numerous experiments with different chemical compounds, Greenhowe (1930) recommends the use of naphthalene, as he found from years of experience that it was thoroughly reliable. This treatment consists in broadcasting crude or flake naphthalene over the carrot bed when the carrot seedlings are well above ground, using it at the rate of 1 oz. to 2 square yards or 1 lb. to 40 square yards, further applications at the same rate being made at seven- to ten-day intervals as required. Usually six to eight applications are necessary.

Unfortunately, there are no control methods suitable for use on a farm scale in this country. The most that can be done is to sow the carrots after the main period of emergence of the first brood is over. This point, however, will vary according to locality, and can only be determined by subsequent observations when the fly becomes prevalent.

## Ceroplastes rusci and C. rubens (Scales).

These are both scale insects of wide distribution. They are pests of citrus, and when present in large numbers give the trees a sooty blackened appearance, due to the presence of a mould which grows prolifically on the honeydew which the insects secrete. The first record of their presence in New Zealand came from near Henderson, Auckland, in July of 1932.

### Ceroplastes rusci.

The covering or test of the adult female (Fig. 4) is approximately $\frac{1}{8}$ in. in diameter and $\frac{1}{8}$ in. deep. It is dirty white to pale grey in colour, with a narrow horizontal band of orange-yellow or yellowish red. In general appearance it resembles a barnacle.

Bodkin (1927) found from a study of its life history in Palestine that it overwinters in the adult stage and gives forth as many as one thousand young in the spring. The young larvæ spread on the foliage and twigs and are carried by wind to other plants. They are at first dull red in colour, but in a week's time they have settled down and become conspicuous owing to the production laterally of glistening white waxen processes (Fig. 5). The young scales may be found on both surfaces of the leaves, though by far the greatest proportion occur on the upper surfaces. After a month they again migrate, this time to the stems and leaves or to the upper or more tender portions of the young shoots. After this migration the lateral wax processes disappear, and the wax

FIG. 4. CITRUS-TREE TWIGS WITH TESTS OF ADULT FEMALE CEROPLASTES RUSCI. × ABOUT 3.

[*Photo. by H. Drake.*

FIG. 5. SECTION OF CITRUS LEAF SHOWING DIFFERENT STAGES OF YOUNG SCALES OF CEROPLASTES RUSCI. × ABOUT 5.

[*Photo. by H. Drake.*

plates of the adult insect become slowly apparent. In seventy or eighty days this first generation becomes sexually mature and begins producing larvæ. A further generation then follows which reaches maturity in the autumn. This generation passes the winter in the adult stage and produces young in the following spring.

### Ceroplastes rubens.

The test of the adult female of *C. rubens* is described by Maskell (1893) as waxy, rather thick, dull-red or pinkish throughout (among other characteristics). He states that it is subcircular with irregular sloping sides and flattish top, in the centre of which there is sometimes a minute indistinct orifice, the diameter of the test varying from $\frac{1}{11}$ in. to $\frac{1}{4}$ in. In Japan it is found that this scale has only one brood. The overwintered female begins egg-laying in the early summer and continues to do so for about a month. The average number of eggs laid is 987. By late autumn the young scales from the summer eggs have reached the adult stage. These adult scales overwinter as such, and again give rise to eggs in the summer following.

*C. rubens* has a very wide host range, and is reported as attacking ninety-two plants representing forty different families. Some of the plants attacked include coffee, cinnamon, fern, tea, mango, palms, figs, plum, pears, and oranges.

### Control.

In countries where *C. rusci* and *C. rubens* have long been established their depredations are considerably reduced on account of the presence of natural enemies, some of which it may be necessary to introduce should the scales become serious pests in this country. It is very probable, however, that two close ratio 2-per-cent. summer-oil sprays, applied in the spring or summer when the young scales are on the move, will give the necessary control.

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The writer wishes to thank the Imperial Institute of Entomology for the identification of *Listroderes costirostris* and *Psila rosæ*, and Mr. G. Brittin, of Motueka, for the identification of the two scale insects.

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# SOME SOILS OF THE NORTH CAPE DISTRICT.

R. E. R. GRIMMETT and F. J. A. BROGAN, Chemistry Section, Department of Agriculture.

THE majority of the soils of New Zealand, as pointed out by Aston(1), belong to the immature, skeleton, or mineral class of Glinka(2). Several causes contribute to this condition. Among others may be instanced the marked and broken topographical relief due to geologically recent earth movements or mountain-building, causing rapid erosion of soil as soon as it forms at the higher levels; the raising of areas of the sea floor above high-tide level; and volcanic activity, especially the air-borne showers of dust or mud which cover up old soils and provide the raw material for new ones. Examples of immature soils due to these three causes are found in the mountains and flood plains of Canterbury or Wellington; the raised beaches of Wellington and raised mud-flats of Hawke's Bay, and the volcanic soils of the North Island central region.

An exception to this general rule, however, appears to occur in the North Auckland district, particularly in the case of those areas of soil called collectively the "gum-lands." The soils thus designated occupy positions of comparatively gentle relief, the surface of the land being usually of the hummocky type and poorly drained. They once supported forests in which the kauri tree had thriven for long periods of time, leading to accumulations of kauri gum in the soil, often to depths of many feet. In other words the soil had been built up slowly in place as a product of forest and climatic conditions, and in the absence of volcanic dust showers or of alluvium (the effect of river-flooding being restricted to localized areas) it is to be expected that such soils would be mature in profile, thus falling within some section of the group of soils classified by Glinka on a climatic basis. It is probably to this cause that the high clay content, pronounced acidity and lime-requirement, and the frequent presence of ironstone pans in the gum-lands are due.

In the North Cape area practically no kauri trees are now to be found, but most of the flat or more gently sloping country has carried kauri forests in the past and has been dug over for kauri gum. A fairly typical profile is that exposed in a road cutting near Tikorangi Trig. between Te Paki and Parengarenga Harbour. This is of the "podsol" type—*i.e.*, with an upper horizon (A) leached of bases which have been redeposited at a lower level (horizon B). The country here is of a gently rolling, maturely dissected type, the rocks being mostly soft tertiary sandstones, grits, and conglomerates. Soils of this type occur over considerable areas between the eastern end of Spirits Bay and the north shores of Parengarenga Harbour (see description of samples B/775, 781, and 789).

The country adjacent to the western arms of Tom Bowling Bay and Spirits Bay is more elevated and broken, the soils on the steeper slopes having only partially developed profiles. They are therefore immature, fragments of the parent rocks which are here mostly basaltic or andesitic being present in greater or less quantity according to the steepness of the slope and consequent degree of soil creep and erosion. The bright red colour of large areas of these soils is due probably to

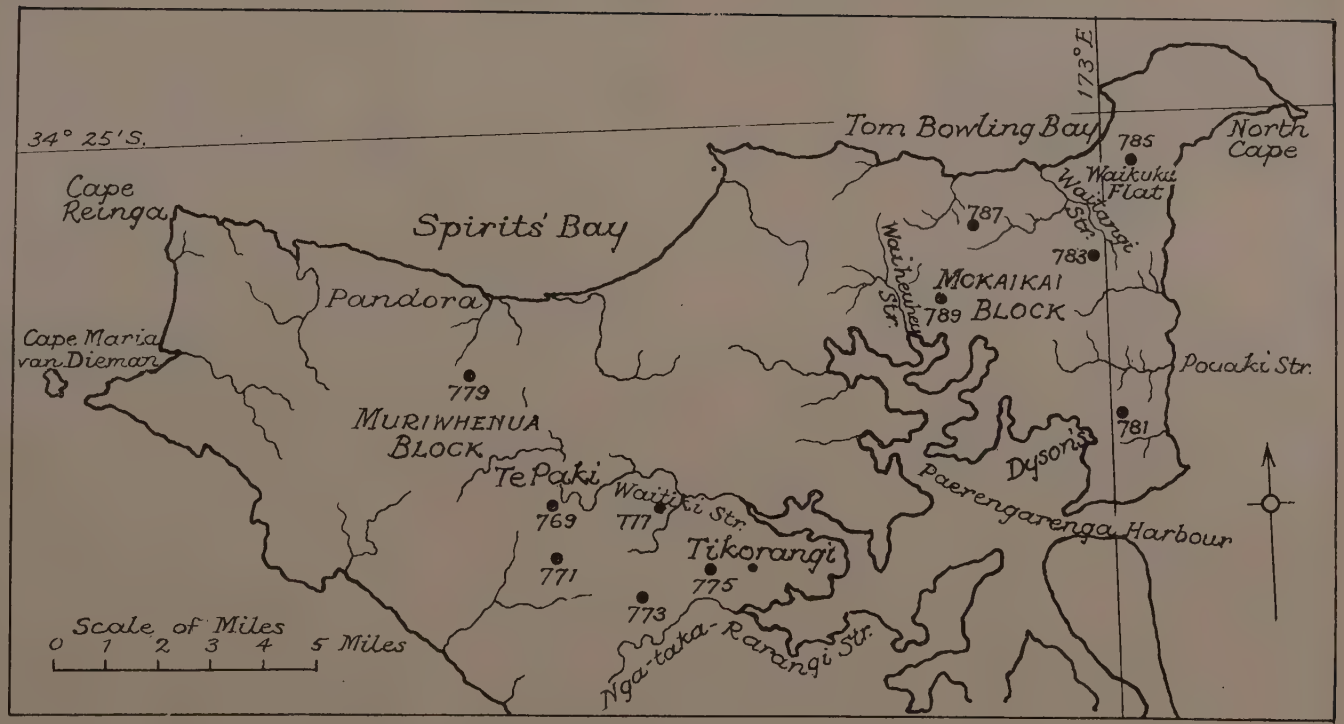


FIG. I. SKETCH MAP OF THE CAPE MARIA - NORTH CAPE AREA.
Dots and numbers indicate soil samples taken.

erosion having removed the original topsoil (following the disappearance of the forest), exposing the subsoil or "B" horizon which had been enriched with deposited iron oxides derived by leaching from the overlying layers, rather than to development in place as a "lateritic" soil. Bracken fern, secondary growth rain forest, and manuka scrub occur intermixed on these soils.

A third group of soils occupies most of the country for many miles south of Waitiki Stream and Parengarenga Harbour. These soils are derived from wind-blown sand carried inland from the beaches (principally the western or Ninety Mile Beach) and are found in all stages of formation, from wandering dunes devoid of plant covering and purely mineral in nature, through fixed dunes with more or less vegetation chiefly of a heath type but with very little true soil, to ancient fixed dunes in which the sand has become converted into a very soft sandstone with a surface zone weathered and showing various structures and horizons according to situation and plant covering, which has varied from scrub to kauri forest in the past, but is now principally manuka heath.

The accompanying map showing the position of soil samples is redrawn from Bartrum and Turner's geological sketch map of the Cape Maria - North Cape area, of which free use has been made in correlating the soils with geological structure. The detailed geology may be consulted in the article by these authors in the *Transactions of the New Zealand Institute*, Vol. 59, 1928, pp. 98–138([3]).

Judged by ordinary standards, the soils of this area, from the chemical point of view, are decidedly poor. They are mostly very acid; lime, magnesia, potash, and phosphoric acid—particularly the portion termed "available"—are deficient, the latter in some cases being present in traces only.

It must be remembered, however, that for horticulture, the mineral plant foods present in the soil are of less importance than its physical nature combined with climatic factors. If such factors as rainfall and its seasonal distribution, shelter from prevailing winds and salt spray, sunshine, prevalence of frost at various periods of the seasons, drainage, depth and texture of soil are favourable to fruit of the species it is desired to grow, then it is a relatively simple and inexpensive matter to supply deficient mineral foods such as phosphoric acid or potash. Nitrogen may be readily supplied by green manuring among the trees with such crops as lupins or crimson clover, at the same time improving the tilth.

Lime, required to correct extreme acidity, to improve the tilth, and to keep added phosphates in an available condition, in the case of the heavier soils of high lime-requirement, may present a more difficult problem. So far as can be ascertained, deposits occurring in the Northern Peninsula are not particularly extensive nor of high grade, though some of the beach sands of the north coast consist in places, as reported by Bell and Clark([4]), entirely of comminuted shells. The extent of such deposits, however, would require to be estimated before it could be stated whether they are worth considering as a source of lime for horticultural purposes.

For pastoral purposes experiments would be desirable to determine the most suitable pasture plants, and fertilizers for use in top-dressing on each of the main types of soil.

## Analyses of North Cape District Soils.

Results, except*, are percentages on soil dried at 100° C.

| Laboratory No. | Locality. | Volatile Matter. | | | 1 % Citric-acid Extract, Dyer's Method, Hall's Modification. ("Available Plant Food.") | | | | | Hydrochloric-acid Extract. ("Total Plant Food.") | | | | Lime-requirement, % $CaCO_3$. | | pH.* | Soil Structure. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | * On Air-drying. | * At 100° C. | On Ignition. | Total Nitrogen. | Lime, CaO. | Magnesia, MgO. | Potash, $K_2O$. | Phosphoric Acid, $P_2O_5$. | Lime, CaO. | Magnesia, MgO. | Potash, $K_2O$. | Phosphoric Acid, $P_2O_5$. | On Air-dried Soil. | On Soil dried at 100° C. | | |
| B/765 | Waipapakauri .. .. | 12·7 | 1·4 | 6·4 | 0·122 | 0·046 | 0·029 | 0·008 | 0·002 | 0·17 | 0·16 | 0·05 | 0·017 | 0·23 | 0·23 | 5·9 | Coarse sand. |
| B/767 | Gum Co.'s land, Muriwhenua Block | 7·1 | 0·6 | 3·6 | 0·087 | 0·049 | 0·034 | 0·006 | 0·005 | 0·64 | 0·49 | 0·25 | 0·034 | 0·12 | 0·12 | 6·0 | Coarse sand. |
| B/769 | Boundary Te Paki Station and Muriwhenua Block | 20·0 | 0·9 | 6·5 | 0·137 | 0·044 | 0·032 | 0·006 | 0·002 | 0·24 | 0·14 | 0·06 | 0·005 | 0·27 | 0·27 | 5·3 | Coarse sand. |
| B/771 | Muriwhenua Block .. .. | 11·5 | 0·9 | 4·6 | 0·088 | 0·039 | 0·033 | 0·007 | 0·001 | 0·34 | 0·27 | 0·13 | 0·014 | 0·19 | 0·19 | 5·5 | Coarse sand. |
| B/773 | Muriwhenua Block .. .. | 24·1 | 1·1 | 8·6 | 0·106 | 0·033 | 0·027 | 0·004 | 0·002 | 0·13 | 0·09 | 0·03 | 0·012 | 0·53 | 0·54 | 5·0 | Coarse sand. |
| B/775 | Muriwhenua Block .. .. | 17·7 | 2·1 | 5·6 | 0·127 | 0·035 | 0·044 | 0·007 | 0·001 | 0·13 | 0·25 | 0·35 | 0·008 | 0·41 | 0·42 | 5·1 | Silt loam. |
| B/777 | Muriwhenua Block .. .. | 25·3 | 2·6 | 17·0 | 0·198 | 0·077 | 0·088 | 0·015 | Trace | 0·24 | 0·76 | 0·18 | 0·050 | 0·58 | 0·60 | 5·4 | Clay. |
| B/779 | Te Paki Station, Reinga .. | 23·0 | 3·2 | 14·5 | 0·239 | 0·208 | 0·200 | 0·014 | 0·001 | 1·36 | 1·64 | 0·16 | 0·029 | 0·29 | 0·30 | 6·2 | Clay loam. |
| B/781 | Mokaikai Block, Parengarenga | 13·8 | 0·4 | 5·1 | 0·095 | 0·032 | 0·031 | 0·005 | 0·002 | 0·07 | 0·09 | 0·02 | 0·007 | 0·24 | 0·24 | 4·8 | Silt loam. |
| B/783 | Mokaikai Block, Parengarenga | 20·7 | 1·1 | 14·1 | 0·117 | 0·048 | 0·062 | 0·011 | Trace | 0·14 | 0·28 | 0·05 | 0·030 | 0·37 | 0·37 | 5·3 | Clay. |
| B/785 | Mokaikai Block, Parengarenga | 14·0 | 0·3 | 7·9 | 0·091 | 0·041 | 0·034 | 0·006 | 0·001 | 0·10 | 0·09 | 0·01 | Trace† | 0·29 | 0·29 | 4·7 | Fine sandy silt. |
| B/787 | Mokaikai Block, Parengarenga | 21·7 | 1·6 | 15·2 | 0·189 | 0·046 | 0·060 | 0·010 | Trace | 0·19 | 0·34 | 0·06 | 0·057 | 0·52 | 0·53 | 4·9 | Clay. |
| B/789 | Mokaikai Block, Parengarenga | 17·2 | 1·4 | 7·6 | 0·133 | 0·035 | 0·045 | 0·007 | ,, | 0·11 | 0·55 | 0·32 | 0·007 | 0·60 | 0·61 | 4·6 | Clay loam. |

† Less than 0·005 per cent.

From the textural point of view the mechanical analysis of the samples collected indicates the great diversity which is present in these soils.

## Description of the Samples.

*In the Muriwhenua Block* or western portion of the area the greater part is occupied by three types of sand-dunes. Bordering the Ninety Mile Beach is a narrow belt of low recent dunes partly fixed by sand-binding plants, manuka, cassinia, and other low growing shrubs. Sample B/767 (opposite Matapia Rock) is typical of this formation. In common with all the blown sands of this area to be tested, its texture is that described as a "coarse sand." It contains, however, considerably less of the finer particles (silt, fine silt, and clay) than the older dunes inland, and consequently would have very little "binding" or water-retaining capacity once the scanty plant covering was removed. Its contents of "total" lime, potash, and phosphoric acid are considerably higher than is the case with the older sand-dunes, though there is little difference in the "available" column. It should be pointed out that all the blown sands on the western side of the peninsula consist of only partially weathered, comminuted rock material containing particles derived from a variety of rocks, and consequently capable of weathering to form soils, while those of the east coast are frequently almost pure silica sand and thus quite useless from an agricultural point of view. No samples of the latter were obtained by the writers on this account.

The second type of sand-dune is the large wandering dune completely bare of vegetation and usually situated between the foredune area and the old consolidated dunes. Some very considerable areas are occupied by these wandering dunes, which would be a menace to farms established in their vicinity unless fixed by sand-binding grasses or other means.

The ancient fixed dunes occupy perhaps a third of the block—the central portion. The topography is of the undulating to hummocky and in places steep hilly type, with large and small basins where shelter could be provided by planting belts along the ridges. The bottoms of many of the basins are occupied by kauri gum swamp which has been dug and redug, rendering draining operations difficult. It is only the slopes, therefore, which can be considered as capable of immediate development.

Samples B/769, 771, and 773 are typical of this formation. B/769 is from a bench-like flat on blown sand about one mile south-east of Te Paki homestead. In parts it is covered with shallow gum swamp, in parts simply damp, with rushes and manuka. B/773 is from a much more extensive swampy low-lying flat near the centre of the block, in which gumdigging operations are in progress. These two samples are much alike. The clay content is very small; the loss on ignition (or humus) is very low for a swamp soil; the acidity is considerable; and the lime-requirement, especially of the second, rather high. Mineral plant foods are deficient.

B/771 is from one of the drier northerly slopes between the two samples last mentioned, and represents what was considered about the most promising type of soil in a situation suitable for fruit. In clay content, acidity and lime requirement, and "total" lime, potash, and phosphoric acid it has a considerable advantage over the other two samples. It will be seen to resemble very closely B/765, which is from an area of similar ancient dune land at Waipapakauri near the south end of the Ninety Mile Beach. At this latter place passion-fruit culture is being carried on, somewhat primitively, but with every appearance of success as far as growth of vines and production of fruit is concerned. This locality is nearer the beach than the inland half of the Muriwhenua Block.

The portion of the block on the eastern side between the lower or tidal parts of the Waitiki and Nga-taka-rarangi Streams lies outside the area of

FIG. 2. PANDORA AND SPIRITS BAY.

FIG. 3. WANDERING DUNE ADVANCING ACROSS BED OF TE PAKI STREAM; ON LEFT, FIXED DUNE WITH MANUKA HEATH COVERING.

windblown sand, and the soils appear to be derived from beds of the Tertiary series, in part sedimentary and in part volcanic (conglomerates). B/775 and B/777 are from this locality. B/775 is from a gently rolling hillside above a long smooth slope about one mile west of Tikorangi Trig. The soil is a heavy silt loam cracking into hard blocks when dry, and would probably puddle in wet weather. The topography is of the gentle, mature type, and the soil profile as seen in road cuttings is also of a mature type. The zone of practically complete weathering or disintegration of the rocks extends to many feet (over 10 ft.); the upper two or three feet are a nearly white pipeclay (horizon A) below this being a horizon (B) of variable width, of enrichment with ferric hydroxide forming a pan in places, probably derived by leaching from the upper layer. Below this are layers of clay-like material derived from decomposed rock, of varying colour. There is a resemblance to the pakihi soils of the west coast of the South Island. The vegetation is low manuka, rushes, *Pomaderris elliptica*, *Dianella intermedia*, Drosera, Gleichinia fern, and similar plants loving sour undrained soils. Some kauri gum has been dug, but the holes are shallow. Chemically this soil is very acid, has a comparatively high lime-requirement, and is notably

deficient in lime and phosphoric acid, though fairly well supplied with "total" potash. It would be a difficult soil to cultivate. (It is similar in origin and character to B/781 and 789 in the Mokaikai Block.)

B/777 comes from more broken country near the most northern portion of the block adjacent to the Waitiki Stream. The soil is comparatively immature, containing lumps and blocks of the andesitic volcanic conglomerate from which it is derived. It is dark coloured, black or red, and fairly friable, though classed as a "clay" by analysis. Chemically it is less acid than the preceding sample, though it has a higher lime-requirement, and the humus appears to be satisfactory. The content of "total" phosphoric acid is fair, though very little is in an available condition. In origin and character this soil is related to B/783 and 787 in the Mokaikai Block.

B/779 exemplifies an area of passable pasture land from a high ridge on Te Paki station, about half-way from the homestead along the road to Pandora. It has never been manured, but a little grass seed has been sown following burns from time to time, and sheep and cattle have frequently been mustered along this route. Possibly this explains in part the better pasture and some of the higher soil fertility over surrounding areas. The soil is derived from the old andesitic rocks. This soil from Pandora Ridge is comparatively rich in lime and magnesia, though deficient in phosphoric acid.

*The Mokaikai Block* or western portion of the area comprises three main soil formations as described in the following notes :—

(1) The southern portion of the block, south of Pouaki Stream and the most northerly inlets of Parengarenga Harbour, consists geologically of sedimentary strata, principally soft sandstones, with some mudstones, grits, &c. The soils derived from these rocks are exemplified by B/781, taken about half a mile north-east of Dyson's Landing (south of Pouaki Stream) ; and B/789, taken about one mile east of Munro's homestead (on the Waiheuheu Stream). The first is a silt loam, the second a clay loam. The content of humus is low for soils of this texture. The most notable feature is, however, the great acidity, a pH as low as 4·6 being uncommon among soils used for agricultural purposes. In the case of B/789 the lime-requirement is also high. Lime, potash, and phosphoric acid are deficient in all cases except the "total" potash in B/789. These soils are occupied by vegetation of a heath nature, low manuka, Pomaderris, Leucopogon, Cyathodes, rushes, &c., and though lying in gentle to moderately steep slopes are inclined to be waterlogged in the wetter weather. They have been dug over for kauri gum in many places. Altogether they are not promising for early horticultural development, as the soil would need much preliminary treatment, such as drainage, liming, green manuring, and fertilizing. Factors of aspect, topography, and climate are favourable in certain portions.

(2) The northern portion of the block, with the exception of Waikuku Flat, consists geologically of conglomerates principally composed of andesite (a volcanic rock of moderately basic nature). This gives rise to soils of which B/783 and B/787 are examples. The soil is mostly of a yellow, reddish, or deep red colour, with here and there concretions of ironstone (limonite or hæmatite) which, as already explained, have probably been exposed on the surface by soil erosion. The topography is that of rolling to steep hills, the flatter portions and basins of which are in many cases suitably situated for fruitgrowing. Although the top-soils are classified as "clays" on analysis, there is a good deal of grit in the subsoils, the substrata are open in texture, and the conglomerate being fairly pervious to water there is every evidence of good drainage conditions. The vegetation is almost exclusively bracken fern (a deep-rooting plant liking an open soil and good drainage), with some tutu and a very little manuka, rushes, tussock, native orchids, sweet vernal, brown-top, Pomaderris, &c.

B/783 is from a gently undulating slope about 300 to 350 ft. above sea-level near the headwaters of the south-east branch of Waitangi Stream. B/787 is from a steep to rolling area at 600 ft. above sea-level near the headwaters of the south-west branch of the same stream—*i.e.*, towards the north-west corner of the block. The analyses are nearly identical for the two samples, indicating considerable uniformity in this type of soil formation over extensive areas. The loss on ignition (" humus ") is much greater than in the soils of the southern half of the block, while the acidity is less. A fairly high though not abnormal lime-requirement is indicated. Lime and potash are deficient. " Total " phosphoric acid is present in greater amount than in many of the soils, but practically none of it is in the " available " condition, a fact possibly due to a high content of iron and aluminium as indicated by the colour and the high percentage of clay. This type of soil appears promising for fruit if lime, phosphate, and perhaps potash are applied as required for the different varieties.

(3) Waikuku Flat is low lying, with a watertable close to the surface and not easily drained. Its soil is alluvial, of a fine sandy silt texture (B/785), very acid and poor in all respects. The establishment of pasture of suitable type is the chief hope for the utilization of this class of soil.


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# A SIMPLE ULTRA-VIOLET RAY APPARATUS FOR TESTING RYE-GRASS.

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THE work of Linehan and Mercer in Ireland and of the Department of Agriculture in New Zealand has demonstrated the value of the ultra-violet ray fluorescence test for distinguishing different strains of rye-grasses. The applications of the test and the experimental procedure have already been fully described in this *Journal* (December, 1931) by N. R. Foy, so the present paper is confined to a discussion on the ultra-violet ray generators tried at Canterbury Agricultural College, and to a description of a daylight apparatus suitable for seedsmen and others.

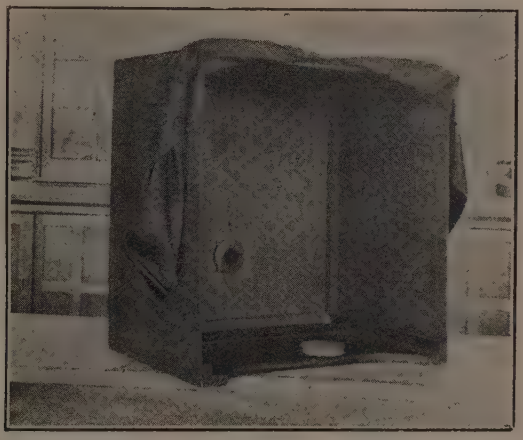
The blue fluorescent light produced by seedlings of certain strains of rye-grass in the invisible ultra-violet rays must not be obscured by ordinary light, so that it is necessary to examine the seedlings in comparative darkness and to remove with a " Wood's " filter, or its equivalent, the visible rays which are almost invariably generated along with ultra-violet rays. A box or cabinet fitted with a filter is therefore required.

The most elaborate and powerful generator used in the test is the quartz mercury vapour arc lamp, which, however, is too expensive for most workers. A much cheaper although less powerful glass mercury vapour arc lamp (G.E.S. 1) containing a filament to start the arc has

been developed in recent years, and one used at Canterbury Agricultural College gave entire satisfaction. This lamp requires a special transformer equipment to light it, but this can be constructed locally for a few pounds. Information on the construction of this generator may be obtained from the College.

An ordinary carbon arc lamp fitted with a water-cooled filter was found to give quite satisfactory results, but the large amount of heat radiated, and the general inconvenience of handling the arc, make it much less desirable than the filament type mercury vapour arc lamp referred to above.

Daylight was tried at the beginning of the experiments at Lincoln, but, owing to the use of unsatisfactory light filters, gave negative results. A "Wood's" filter fitted into a special box, however, proved to be entirely satisfactory with daylight. (*Nature*, 131, 3309, p. 474.) These filters can be obtained in New Zealand.



CABINET FITTED WITH "WOOD'S" FILTER FOR ULTRA-VIOLET RAY TEST AS USED AT CANTERBURY AGRICULTURAL COLLEGE.

The cabinet now used at the College—in preference to a mercury vapour lamp—is shown in the photograph. Suitable dimensions are height, 2 ft. 6 in.; width, 2 ft.; depth, 1 ft. 6 in. In the back of the cabinet a 2-in. "Wood's" filter is mounted at such a level that ultra-violet rays from a window, preferably facing north, can irradiate the germinating seedlings. It is important that the box should be high enough to allow the operator to look down on to the dish from above, since the rays, although invisible, can cause severe eye strain.

Contrary to expectations, ordinary glass does not interfere greatly with the rays responsible for the fluorescence, so that they may be passed through window glass and through the bottom of the Petrie dish held at a convenient angle to the filter.

This simple apparatus gives excellent results, even on cloudy winter days, and entirely obviates the necessity for the generation of artificial rays during the day.

# INVESTIGATIONS IN PASTURE PRODUCTION.

## V. EFFECT OF APPLYING SUPERPHOSPHATE AT DIFFERENT TIMES OF YEAR AND OF HEAVY DRESSINGS OF SULPHATE OF AMMONIA ON YIELD OF HERBAGE.

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THE results of this investigation are fully discussed in Part V of Bulletin 31, Department of Scientific and Industrial Research, and only the salient features will be presented in this article. The title indicates the object of the experiment, which was conducted at the Ruakura Farm of Instruction, Hamilton.

The fertilizer treatments per acre were as follows :—

| | Fertilizer. | Time of Application. |
|---|---|---|
| (1) | No fertilizer. | |
| (2) | Superphosphate* 4 cwt. . . | Winter (June). |
| (3) | Superphosphate 4 cwt. . . | Spring (September). |
| (4) | Superphosphate 4 cwt. . . | Summer (December). |
| (5) | Superphosphate 4 cwt. . . | Autumn (March or April). |
| (6) | Superphosphate 2 cwt . . | Winter |
| | Superphosphate 2 cwt. . . | Summer |
| (7)† | Superphosphate as for No. 6, plus— | |
| | Sulphate of ammonia 2 cwt. . . | Winter (June or July). |
| | Sulphate of ammonia 2 cwt. . . | Autumn (March or April). |

* 44/46 per cent. tricalcic phosphate. † Five applications of sulphate of ammonia were made (total 10 cwt.), the last being in July, 1931, about one year and ten months prior to the end of the four-year period under review.

Production was measured under the system of "alternate mowing and grazing" described in Part I of this series of articles (*Journal* for August, 1931). Plots of each treatment were replicated twelve times in each of duplicate areas, giving a total of twenty-four replications of each treatment.

The period covered was from June, 1929, to June, 1933, a matter of four years, during which time the yields of eighty successive growths were measured. As Treatment 4 did not receive its first application of super until March, 1930, the comparative effects of the dressings made at different times on total production is confined to the last three years of the trial.

The yields of green herbage from No Fertilizer and Treatments 2 to 6 receiving super only, and their yields relative to No Fertilizer as 100 were as follows :—

*Table 1.—Total and Relative Yields from June, 1930, to June, 1933.*

| | SUPER APPLIED. | | | | |
|---|---|---|---|---|---|
| None. | Winter. | Spring. | Summer. | Autumn. | Winter and Summer. |
| Treatment 1. | Treatment 2. | Treatment 3. | Treatment 4. | Treatment 5. | Treatment 6. |
| 86,400 lb. | 104,700 lb. | 107,600 lb. | 103,900 lb. | 105,100 lb. | 106,900 lb. |
| **100** | **121·2** | **124·6** | **120·3** | **121·7** | **123·8** |

NOTE.—Yields to nearest 100 pounds. Relative yields calculated from yields to nearest pound.

Although the spring application (Treatment 3) has given the highest production, the differences between it and the twice-yearly application must be considered negligible and are probably fortuitous. The inferiority of the winter and summer dressings is probably real. In the case of the summer applications, burning of the pasture detracted a little from the yield of this treatment for a short period after two of the applications. Burning did not occur after the summer application of 2 cwt. per acre to Treatment 6. The superiority of the spring dressing, assuming it to be real, loses some of its value when the effect of the treatments during periods of low production is considered.

By combining the results for each of the last three complete seasons of the trial, during which all the phosphate Treatments 2 to 6 were receiving their full quotas of fertilizer, it is possible to get some idea of the influence of the different applications on production during high and low production periods. The high and low production periods of the year are those in which the daily rate of production was above and below, respectively, the average daily production for the year. The high production period included the months of September, October, and November in each year. It also included December in 1930, December and April in 1931–32, and February, March, and half of April in 1933. The 1932–33 season was marked by unusually low production in December and January, and unusually high production in February and March, for these times of the year, due to the distribution of rainfall. Of a total of 1,083 days in the three seasons, 441 (40·7 per cent.) had production above the average (high), and 642 had production below the average (low).

The average annual yields of the No Fertilizer treatment for three seasons were: High production periods, 21,025 lb. green herbage per acre; low production periods, 7,762 lb. green herbage per acre.

The relative effects of the different superphosphate dressings for the three years resulted as follows:—

*Table 2.—Yields relative to No Fertilizer as 100.*

| | Super applied. | | | | | |
|---|---|---|---|---|---|---|
| | None. | Winter. | Spring. | Summer. | Autumn. | Winter and Summer. |
| | Treatment 1. | Treatment 2. | Treatment 3. | Treatment 4. | Treatment 5. | Treatment 6. |
| During high production periods | 100 | 115·8 | 118·8 | 111·4 | 114·1 | 116·0 |
| During low production periods | 100 | 135·9 | 140·2 | 144·3 | 142·1 | 144·8 |

It is obvious from the above that all the super dressings have given relatively greater effects during periods of low production than in high ones. *Actual* increases in low production periods were slightly greater than in high ones with Treatments 4, 5, and 6, but the reverse with Treatments 2 and 3.

The influence of the greater relative effects during low production periods is reflected in a better spread of production as is shown by the following table :—

*Table 3.—Percentage of the Total Production from each Treatment.*

| — | Super applied. | | | | | |
|---|---|---|---|---|---|---|
| | None. Treatment 1. | Winter. Treatment 2. | Spring. Treatment 3. | Summer. Treatment 4. | Autumn. Treatment 5. | Winter and Summer. Treatment 6. |
| During high production periods | 73·0 | 69·8 | 69·7 | 67·6 | 68·5 | 68·5 |
| During low production periods | 27·0 | 30·2 | 30·3 | 32·4 | 31·5 | 31·5 |

Each superphosphate treatment has given a greater proportion of its total yield during low production periods than No Fertilizer has. The differences between the superphosphate treatments themselves are small, but, as is the case with the yields in low production periods, Treatments 4, 5, and 6 tend to be superior to the others in giving slightly greater percentages of their respective totals when production is low.

## Effect of Sulphate of Ammonia.

Treatments 6 and 7 received the same superphosphate dressing, but No. 7 received five applications of 2 cwt. of sulphate of ammonia (autumn and winter) in addition. A comparison of these two treatments with No Fertilizer, and between themselves, indicates the effect of the sulphate of ammonia. Both Treatments 6 and 7 received their dressings at the commencement of the trial, so that it is possible to compare their effects for four years.

The first application of sulphate of ammonia in June, 1929, increased production until 8th November, 1929, the actual and relative yields of green herbage per acre from No Fertilizer and Treatments 6 and 7 up to this date being as follows :—

*Table 4.—Production from Treatments 1, 6, and 7, June to November, 1929.*

| No Fertilizer. Treatment 1. | Super, Winter and Summer. Treatment 6. | Super, Winter and Summer, plus Sulphate of Ammonia. Treatment 7. |
|---|---|---|
| 8,119 lb. | 8,977 lb. | 10,535 lb. |
| 100 | 110 | 129·8 |

Subsequent to this date and until about a month after the next application of sulphate of ammonia in March, 1930, the production from Treatment 7 " slumped " below that from Treatment 6.

The effects of subsequent applications of sulphate of ammonia in the autumn and winter were of comparatively short duration. They increased production in the winter and early spring in 1930

and 1931. From about the middle of September to the end of April each year production slumped below that from Treatment 6. As a result of this slumping the increased production in the winter and early spring was more than offset by the decrease, the net result being a lower total production from plots receiving sulphate of ammonia. Applications of this fertilizer were omitted after that in July, 1931, with the object of determining how long the slumping effect would last. It has persisted for nearly two years up to the end of the period under review, with the exception of the winter months May, June, and July, during which production recovered to about the level of or a little above that of Treatment 6.

The percentage increases over No Fertilizer, which yielded 29,400 lb., 30,400 lb., 27,500 lb., and 28,400 lb. per acre of green herbage in the four seasons 1929–30 to 1932–33, were :—

*Table 5.—Increases of Treatments 6 and 7 over No Fertilizer.*

| Season. | Percentage Increases over No Fertilizer. | | Remarks. |
|---|---|---|---|
| | Superphosphate. Treatment 6. | Superphosphate plus Sulphate of Ammonia. Treatment 7. | |
| 1929–30 ... | 14 | 18 | 4 cwt. sulphate of ammonia applied. |
| 1930–31 .. | 25 | 18 | 4 cwt. sulphate of ammonia applied. |
| 1931–32 .. | 20 | 11 | 2 cwt. sulphate of ammonia applied. |
| 1932–33 .. | 26 | 15 | No sulphate of ammonia applied. |

Over the whole of the four-year period under discussion Treatments 6 and 7 yielded 21·4 per cent. and 15·7 per cent. respectively more than No Fertilizer.

It should be pointed out that sulphate of ammonia was used more intensively than is now practised or advocated, and that lime was not used to counteract its acidifying effect on the soil. Lime was not used because it was not expected that increased acidity of the soil would influence production appreciably until a good deal of sulphate of ammonia had been used. The neglect to use lime may have been a contributing if not the whole cause of the slumping in production, although it will be shown in a later article that liming has not entirely overcome this undesirable effect at Marton.

At the time of commencing this investigation a few farmers at least were using sulphate of ammonia along the lines in which it was used in this trial, although in smaller quantities, and if the results only indicate how sulphate of ammonia should *not* be used some good will have been achieved. It should be stated, however, that in the opinion of the writers the user of 1 cwt. of sulphate of ammonia per acre—or other nitrogenous fertilizer—once every two or three years on the same pasture, for the production of "out-of-season" grass, need have no fear of any appreciably bad effect following its use so long as common-sense management, and lime, phosphate, and/or potash, where necessary, are also used.

### General Comments.

From point of view of total yield, or from its effect on distribution of production, the winter application of super is the least advantageous. The differences between the other applications are slight, favouring spring application for the period when pastures are normally closed for hay or silage, and in total production, but favouring summer, autumn, and twice-yearly application from point of view of improving production a little more when it is naturally lowest.

The response to superphosphate has been comparatively small, and, in view of the reputation possessed by the Waikato soils of being highly responsive to phosphate. it is practically certain that the effect of superphosphate obtained in this experiment is less than that commonly occurring on these soils. With a greater response to phosphate it is probable that the differences in the effects of the treatments at different seasons of the year would be greater than is shown here, and that the benefits in low production periods of applying super in the summer and autumn would be enhanced.

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# ESTABLISHMENT AND MANAGEMENT OF PERMANENT PASTURES ON THE LIGHT LANDS OF THE CANTERBURY PLAINS.

*(Continued.)*

A. H. Flay, B.Sc., M.Agr.Sc., Canterbury Agricultural College, Lincoln.

### 7. Harrowing.

Of late years, harrowing of permanent pastures has received much consideration so far as light land permanent pastures are concerned. There does not appear to be much advantage from it. Good cocksfoot and rye-grass swards, with or without red clover, do not need opening up; they are usually too open as it is, and the difficulty is to keep them dense. The soil requires little, if any, aeration. During dry spells it is amply aerated. The removal of weeds and roughage from good swards is of doubtful value on these light lands. Roughage on good swards may be an advantage and acts as a reserve for winter feed. Light or chain harrowing which spreads droppings is rarely necessary where only sheep are carried. If harrowing is carried out at all, it should not be too severe, and it should only be done in late June or July. Where the team can be kept usefully occupied even light harrowing of good permanent pastures on light land cannot be recommended.

### 8. Good Permanent Pastures and their Effect on the Management of the Farm.

With pastures of the type described and their proper management the costly supplementary crops such as green-feed oats, Italian rye-grass, kale, oatsheaf chaff, and turnips can be reduced

to a minimum. On better classes of light land, grass, either young or permanent pasture, may replace the greater part of the turnip crop. On one farm a pasture was shut up in March and was rationed through the winter in exactly the same way as a turnip crop. It was fenced into small breaks on to which the sheep were grazed for one or two hours daily and then put on to a run off where they received a small quantity of chaff. This principle might well be applied to early-sown (November) young pastures with profit.

Oats must be grown for a reserve and for horse feed. Like green-feed oats, Italian rye-grass for late autumn and early spring green-feed may be essential under certain circumstances, but could be replaced very largely by new permanent pastures sown the previous summer or autumn. Where oats and wheat are still payable crops, Italian rye and/or green-feed oats fit in well with the cropping programme, but if new permanent pastures are being established these crops should not be necessary to provide spring green-feed. With proper seed-bed preparation, November or December is probably the best time to sow these new permanent pastures for autumn and early spring green-feed. Already on several farms this has been so. New grass available for grazing from February to March and onwards allows a reduction in the area of rape or kale.

At present these light lands of the Canterbury Plains are, in the main, fattening farms. With high producing, permanent, top-dressed pastures, carrying early born, quick-maturing lambs, at least 50 per cent. should go off the mothers fat in normal seasons. Often the loss of production and the cost of ploughing and re-establishing good permanent pastures would be too high if rape and kale were grown solely for fattening lambs. Where wheat or oats follow the rape crop in the rotation, the growing of minimum areas of this lamb fattening crop should be economical while the land is being cleaned of twitch and permanent pastures are being established. The degree of lightness of the area farmed determines the policy. The difference between "store" and "fat" lamb prices must on the average balance with the costs of rape-growing mentioned above. This is most important on land too light for profitable grain crops.

An excellent example of over 90 per cent. of lambs being sold fat off the mothers and the remainder as stores without any supplementary feed is on record for the dry season of 1931–32. Similar results were secured in the previous season, except that the stores were fattened by rape. In the season 1932–33 67 per cent. were fattened on the mothers and 33 per cent. on rape. Grain fattening has not been tried on this farm. The pastures consisted of cocksfoot, perennial rye-grass, red and white clover, with hair-grass and trefoil present. Top-dressing with small quantities of superphosphate had been carried out at intervals for ten years.

Store lambs may be finished off on these light lands by the aid of grain. At present, where rape or kale are too risky and unprofitable and good permanent pastures are being established, these pastures if sown in November-December will finish off up to

five lambs per acre during a normal autumn. By the use of grain in the average autumn this figure could be raised to eight or ten lambs per acre. At present store lamb prices, as a rule, are high in comparison with fat lamb prices, but if all light land farmers ceased to purchase lambs for fattening and even sold stores, the margin between the two prices would widen. It would then be more profitable for the light land farmer to fatten his percentage of stores not fattened on the mothers than to sell as in the present practice mentioned above. Where good pastures are the order and rape and other lamb fattening feeds are reduced to a minimum, some of the store lambs may be grown on red clover or fresh grass picking, or even fattened on these. Where such feeds are available, though not in abundance, lambs could be fattened by feeding a daily grain ration to supplement the green picking. At the present margin between store and fat lamb prices this practice of grain feeding has proved profitable on light land farms.

It is certain that the type of pasture recommended will raise the ewe carrying capacity of these areas by 50 to 100 per cent. over that where brown-top, danthonia, &c., are the dominant herbage. Where pastures are thin, run out, and indifferently sown, similar increases in carrying capacity can be secured. Grazing records show that it is doubtful if the carrying capacity of the farm as a unit would be much higher where the continuous sowing of temporary sheep feeds (including temporary grasses) are carried out, than where the farm is in good permanent pasture plus the minimum turnips, green-feed, &c. The cost of carrying the sheep is considerably greater with the former temporary that with the latter permanent feeds. Where temporary crops are the main sheep feed the loss of production during the essential fallow between crops and the establishment period operate against high carrying capacity.

By growing permanent pastures of the desirable type—*i.e.*, a portion of the farm in dominant cocksfoot, another in dominant rye-grass, and a third in dominant red clover, turnips, chaff, green-feed, &c.—the carrying capacity of light land farms could be raised and working costs kept at a minimum. The advantage of growing different types of pastures as described not only reduces the possible severity of grass grub attack in any one year, but also secures a better distribution of feed production. The present situation when run-out pastures revert to brown-top, &c., in two or three years, and the urgency of ploughing such areas, is changed to one in which the farmer hesitates before ploughing a field of good permanent grass. The problem becomes no longer that of ploughing so many run-out fields each year, but one of deciding which of all the good swards must be broken up.

### 9. Cleaning Brown-top Areas and Fitting in Permanent Pasture Establishment.

One difficult problem confronting the light land farmer in these times is the expense of cleaning his land properly before sowing good permanent pastures.

At the present time these lands are growing wheat, oats, turnips, rape, kale, and green-feed oats, and these are used as cover crops

for grass. This practice has been made necessary by the high proportion of land waiting to be ploughed (the grass having run out, &c.), and sown down again as soon as possible. It is not possible to stop this practice of sowing grass with another crop immediately, but some gradual alteration in the farm management must be made in order to permit the sowing of grass alone. The change must be slow so as to avoid heavy expense. In fact, if made slowly and in the right way very little extra expense, if any, need be incurred in permanent pasture establishment. After having established a good permanent pasture proper grazing is essential. Top-dressing should be carried out on the new pasture, which will not have to be ploughed again in a year or two. To avoid this frequent renewal the grass must be sown on a clean properly prepared seed-bed as previously described.

By making a change in the method of pasture establishment—say, for one field each year—there should be no loss in production. If sown in November or December this field will give a certain amount of late autumn lamb fattening feed, winter feed, and early spring feed. If sown in January or February it will give early spring feed.

The cleaning of light land of brown-top appears a formidable task, and no doubt it is costly if the cleaning is to be carried out in one year. The loss of income for a season, as well as the working-expenses of cultivation, have to be charged against a whole year's fallow. To avoid this heavy expenditure it is recommended that moderately clean fields, which are easy to cultivate, be the first laid down. This gives the farmer an opportunity to establish permanent pastures immediately with the least possible expense and trouble. The best method of avoiding loss or expenditure on these farms where some crops must be grown is to so arrange the cropping rotation that not only are the twitch and weeds eliminated, but also that the best grass seed-bed preparations are carried out as a part of the normal farm programme. The following rotations are therefore suggested :—

(1) Brown-top or run-out grass—rape—turnips—permanent grass.

(2) Brown-top or run-out grass—turnips—oats or wheat—
—permanent grass.
green-feed oats or
—turnips—permanent grass.

(3) Brown-top or run-out grass—turnips—rape—wheat—
permanent grass.
oats—green-feed oats or
turnips—permanent grass.

The first allows three successive cleaning and fallow periods. The second is not so good in that there is no fallow period between the turnips and oats or wheat, but there are two successive cleanings for the green-feed oats and the permanent grass. The third rotation is a long one and allows of some variation. There are two successive cleanings of the land for turnips and rape, a short fallow period between the wheat and oats, and two successive cleanings before green-feed oats and permanent grass. In the second and third

methods a second crop of turnips may be grown between the green-feed oats and new grass. Thus an extra cleaning is secured.

It will be noted from these crop rotations that the cleaning and fallowing of the land without loss of crop production is the object, and that the permanent grass is to be sown in November or December in the first rotation, and in December, January, or February in the second and third rotations. If turnips are grown between the green-feed oats and new grass, November-December sowing, of course, can be carried out here also.

It is important that the grass be sown at these times when the land can be properly fallowed and finally cleaned. Thus the rotations described allow proper pasture establishment on light lands without affecting normal production.

## Summary.

The pastoral position on the light lands of the Canterbury Plains may be summarized as follows :—

(1) Wheat, oats, stripped grass seed, and chaff can no longer pay the costs of production under the rental fixed during good times. Still less do the supplementary sheep feeds return production costs. Sheep products, although at low values, are the main and only permanent source of income.

(2) The dominant covering of these lands is brown-top, with sweet vernal and creeping fog in more restricted areas, especially the foothills. Danthonia and Chewings fescue are also prominent in certain areas.

(3) Successful farming of these areas depends mainly on a recovery in prices, but efficient management must play a very important part also. Efficient management must include (*a*) the most economical utilization of the present herbage ; (*b*) the introduction of better species of grasses, such as certified perennial rye-grass and cocksfoot ; (*c*) the extended use of red clover ; (*d*) proper pasture establishment to enable a high producing permanent sward to be developed and maintained ; (*e*) the use of seed mixtures to give dominant perennial rye-grass, dominant cocksfoot, and/or dominant red clover swards ; (*f*) top-dressing of these high producing permanent pastures ; (*g*) a reduction of costly supplementary sheep feeds to a minimum ; (*h*) a high percentage of lambs fattened on the mothers.

(4) The effect of good pastures on management is described.

(5) A method of brown-top cleaning and pasture establishment with little, if any, extra expense is outlined.

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The writer wishes to express his appreciation and thanks to all those farmers who kept grazing records, costs, &c., and allowed free observation on their farms at all times in connection with this study. His thanks are also due to various members of Lincoln College, especially to Mr. H. J. Geddes ; and to others for valuable criticism and assistance in writing this paper.

NOTE.—The appendix mentioned in the introduction to this article will follow separately.—Ed.

# THE OFFICIAL SEED-TESTING STATION.

## RECORD OF TESTING OPERATIONS FOR YEAR 1932.

FOR the calendar year 1932 13,917 seed-samples were tested at the Department of Agriculture's Seed-testing Station, Palmerston North. This total represents an increase of 2,151 on the number tested during the previous year, the increase being made up by 1,142 samples for testing and 1,009 rye-grass samples for ultra-violet light examination.

The accompanying Tables 1, 2, and 3 show the distribution, origin, classification, &c., of the various samples.

As from 1st January, 1932, all grass and clover seed samples, with the exception of uncertified perennial, Italian, and Western Wolths rye-grass, were tested according to the rules prescribed by the International Seed Testing Association. The excepted species were not included for the reason that facilities would not permit. The average purity and germination percentages for those species of grass seed

*Table 1.—Origin and Classification of Samples, 1932 and 1931.*

| Origin. | Purity only. | | Purity and Germination. | | Germination only. | | Ultra-violet Light. | | Total. |
|---|---|---|---|---|---|---|---|---|---|
| | 1932. | 1931. | 1932. | 1931. | 1932. | 1931. | 1932. | 1931. | |
| Seed merchants | 84 | 141 | 5,152 | 3,812 | 3,660 | 5,283 | 215 | .. | 9,111 |
| Seed growers and farmers | 1 | 7 | 159 | 143 | 76 | 88 | 16 | .. | 252 |
| Department of Agriculture— | | | | | | | | | |
| Fields Division, general | 2 | 7 | 93 | 170 | 130 | 85 | 36 | .. | 261 |
| Fields Division, stores purchasing | .. | .. | 461 | 42 | 133 | .. | .. | .. | 594 |
| Plant Research Station | 5 | 23 | 47 | 3 | 645 | 305 | 1,130 | .. | 1,827 |
| Seed-testing Station | 189 | 1 | 18 | 39 | 991 | 507 | 498 | 886 | 1,696 |
| Other Government Departments | 1 | 18 | 29 | 175 | 3 | 31 | .. | .. | 33 |
| Massey Agricultural College | .. | .. | .. | .. | 143 | .. | .. | .. | 143 |
| Totals | 282 | 197 | 5,959 | 4,384 | 5,781 | 6,299 | 1,895 | 886 | 13,917 |

*Table 2.—Number of Samples from Land Districts and Centres therein, 1932 and 1931.*

| South Island. | 1932. | 1931. | North Island. | 1932. | 1931. |
|---|---|---|---|---|---|
| Southland (total) | 2,370 | 2,712 | Wellington (total) | 2,193 | 2,078 |
| Gore | 1,466 | 1,592 | City | 809 | 842 |
| Invercargill | 874 | 1,094 | Palmerston North and Feilding | 1,033 | 1,027 |
| Other | 30 | 26 | Other | 351 | 542 |
| Otago (total) | 849 | 898 | Hawke's Bay | 645 | 613 |
| Dunedin | 719 | 810 | Gisborne | 229 | 101 |
| Other | 130 | 88 | Taranaki | 438 | 402 |
| Canterbury (total) | 1,409 | 1,264 | Auckland (total) | 716 | 930 |
| Christchurch | 843 | 722 | City | 651 | 848 |
| Other | 566 | 542 | Other | 65 | 82 |
| Marlborough | 200 | 228 | North Auckland | 49 | 1 |
| Nelson | 13 | 4 | | | |
| Total, South Island | 4,841 | 5,106 | Total, North Island | 4,270 | 4,125 |

tested according to the International rules are shown in Table 4, for the clover species in Table 6, and for uncertified rye-grass, &c., in Table 5.

## Grass and Clover Seeds.

The seasonal average germination percentages of certified perennial rye-grass grown in the Manawatu and the Southern districts were, as is usually the case, well below average. For uncertified seed the average was higher, which fact tends to support the contention of a greater degree of susceptibility of the perennial to the fungus infection responsible for the non-viability of a large proportion of the seed.

Ergot (*Claviceps purpurea*) was recorded as follows: Rye-grass, in 4 per cent. of samples; Chewings fescue, in 2 per cent.; crested dogstail, in 9 per cent.; cocksfoot, in 7 per cent.; brown-top, in 54 per cent.; timothy, in 14 per cent. of samples. Spores of *Tilletia dicipiens* (a species of smut) were recorded for 55 per cent. of the brown-top samples.

*Table 3.—Number of Samples tested of the Various Species of Grass and Clover Seeds, 1932 and 1931.*

| Species. | Number. | | Species. | Number. | |
|---|---|---|---|---|---|
| | 1932. | 1931. | | 1932. | 1931. |
| *Grasses.* | | | *Clovers, &c.* | | |
| Perennial rye-grass .. | 2,281 | 2,394 | White clover .. | 400 | 632 |
| Italian rye-grass .. | 210 | 249 | Red clover .. .. | 307 | 419 |
| Western Wolths rye-grass | 113 | 150 | Alsike .. .. | 61 | 82 |
| Cocksfoot .. .. | 370 | 411 | Alsike and white clover | 17 | 32 |
| Crested dogstail .. | 543 | 802 | Subterranean clover .. | 17 | 44 |
| Chewings fescue .. | 951 | 906 | Strawberry clover .. | 9 | 6 |
| Brown-top .. .. | 375 | 464 | Crimson clover .. | 11 | 8 |
| Danthonia spp. .. | 41 | 27 | Suckling clover .. | 30 | 19 |
| Timothy .. .. | 72 | 81 | Lucerne .. .. | 121 | 67 |
| Fog .. .. | 53 | 53 | Trefoil .. .. | 20 | 21 |
| Meadow fescue .. | 20 | 23 | Lotus major .. | 48 | 36 |
| Meadow foxtail .. | 25 | 33 | Lotus hispidus .. | 1 | 10 |
| Paspalum .. .. | 94 | 57 | Other clovers, &c. .. | 7 | 16 |
| Poa pratensis .. .. | 32 | 30 | | | |
| Poa trivialis .. .. | 7 | 9 | Totals .. .. | 1,049 | 1,392 |
| Prairie-grass .. .. | 20 | 27 | | | |
| Red-top .. .. | 2 | 2 | *Cereals, Vegetables, &c.* | | |
| Miscellaneous grasses .. | 18 | 12 | Oats .. .. | 109 | 59 |
| | | | Wheat .. .. | 65 | 29 |
| Totals .. .. | 5,227 | 5,750 | Barley .. .. | 60 | 24 |
| | | | Rye-corn .. .. | 3 | 9 |
| *Roots and other Forages.* | | | Vetches .. .. | 7 | 4 |
| Swede .. .. | 207 | 245 | Peas (garden and field) | 308 | 251 |
| Turnip .. .. | 326 | 370 | Japanese millet .. | 11 | 17 |
| Rape .. .. .. | 90 | 103 | Vegetables .. .. | 561 | 368 |
| Kale .. .. | 99 | 92 | Flower seeds .. | 18 | 32 |
| Mustard .. .. | 24 | 21 | Forest-tree seeds .. | 8 | 5 |
| Mangel .. .. | 206 | 172 | Seed mixtures .. | 32 | 34 |
| Carrot (field and garden) | 137 | 68 | Miscellaneous .. | 7 | 13 |
| Totals .. .. | 1,079 | 1,071 | Totals .. .. | 1,189 | 845 |

Noxious impurities were recorded for grass and clover samples as follows :—

Californian thistle (*Cirsium arvense*) : Rye-grass, 2 per cent. of samples ; crested dogstail, 28 per cent. ; timothy, 7 per cent.

Ox-eye Daisy (*Chrysanthemum leucanthemum*) : Meadow foxtail, 4 per cent. of samples ; alsike, 2 per cent. ; Yorkshire fog, 4 per cent. ; timothy, 3 per cent.

Ragwort (*Senecio Jacobea*) : Brown-top, 5 per cent. of samples ; Lotus major, 8 per cent. ; white clover, 2 samples.

Dodder (*Cuscuta* spp) : Red clover, 1 sample ; Lotus major, 12 per cent. of samples.

Of the total of 1,895 samples of rye-grass examined by ultra-violet light 267 were received for classification as to type. The number and percentage of samples placed in the different classes is shown in Table 7. Over 1,000 of the 1,130 samples tested for the Department of Agriculture were certification samples, the percentage of fluorescent seedlings being used as a check on the type purity.

*Table 4.—Average Purity and Germination Percentages for the Principal Grass-seeds (Uncertified Perennial, Italian, and Western Wolths Rye-grasses excepted).*

| | Purity. | | | | Germination Capacity. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Average Percentage. | | | | Average Percentage. | Percentage of Samples germinating, in Groups. | | | Average Percentage of Pure Germinating Seed. | Number of Samples. |
| | Pure Seed. | Other Crop Seed. | Weed Seed. | Inert Matter | | Below 80. | 80–89. | 90–100. | | |
| *Certified Perennial Rye-grass (officially drawn samples).* | | | | | | | | | | |
| All samples | 98·3 | 0·3 | 0·8 | 0·6 | 89 | 16 | 3 | 81 | 87·6 | 632 |
| Poverty Bay | 98·5 | 0·3 | 0·8 | 0·4 | 92 | 7 | 3 | 90 | 91·2 | 176 |
| Hawke's Bay | 98·2 | 0·4 | 0·9 | 0·5 | 98 | 1 | 3 | 96 | 96·2 | 311 |
| Manawatu | 98·9 | 0·2 | 0·7 | 0·2 | 61 | 90 | 5 | 5 | 65·2 | 20 |
| Canterbury | 98·1 | 0·1 | 0·3 | 1·5 | 97 | .. | 2 | 98 | 95·0 | 51 |
| Otago | 98·3 | 0·4 | 0·5 | 0·8 | 34 | 95 | .. | 5 | 33·7 | 20 |
| Southland | 98·5 | 0·2 | 0·4 | 0·9 | 46 | 86 | 2 | 12 | 46·1 | 44 |
| *Cocksfoot.* | | | | | | | | | | |
| All samples | 78·8 | 3·9 | 0·3 | 17·0 | 88 | 8 | 40 | 52 | 69·7 | 370 |
| Certified N.Z. | 78·5 | 1·6 | 0·1 | 19·8 | 91 | .. | 31 | 69 | 71·2 | 23 |
| Uncertified N.Z. | 78·5 | 4·2 | 0·3 | 17·0 | 88 | 9 | 40 | 51 | 70·8 | 340 |
| Imported | 92·6 | 0·2 | 0·1 | 6·9 | 68 | 72 | 14 | 14 | 63·0 | 7 |
| *Brown-top.* | | | | | | | | | | |
| Certified | 98·9 | 0·1 | 0·1 | 0·9 | 96 | 0 | 2 | 98 | 94·8 | 130 |
| Uncertified | 97·1 | 0·1 | 0·1 | 2·7 | 93 | 3 | 7 | 90 | 90·2 | 245 |
| Crested dogstail | 97·7 | 1·7 | 0·2 | 0·4 | 81 | 38 | 22 | 40 | 79·3 | 543 |
| Chewings fescue | 97·0 | 0·7 | 0·2 | 2·1 | 90 | 8 | 14 | 78 | 87·4 | 951 |
| Timothy | 99·2 | 0·2 | 0·2 | 0·4 | 95 | 4 | 2 | 94 | 93·1 | 72 |
| Fog | 87·9 | 8·5 | 1·9 | 1·7 | 93 | 2 | 11 | 87 | 88·4 | 53 |
| Poa pratensis | 84·4 | 0·3 | 0·2 | 15·1 | 87 | 16 | 34 | 50 | 73·6 | 32 |
| Meadow foxtail | 56·7 | 2·0 | 2·0 | 39·3 | 56 | 93 | 6 | 1 | 31·5 | 25 |
| Danthonia spp. | 61·6 | 8·3 | 11·7 | 18·4 | 51 | 93 | 5 | 2 | 30·6 | 41 |
| Paspalum | 62·5 | 0·1 | 0·1 | 37·3 | 84 | 26 | 47 | 27 | 53·1 | 94 |

*Table 5.—Average Percentage of Seed Impurity and Germination Capacity of Rye-grasses not tested according to International Rules.*

| | Average Percentage of Seed Impurities. | Average Percentage of Seed Germination. | Percentage of Samples germinating in Groups. | | | Number of Samples. |
|---|---|---|---|---|---|---|
| | | | Below 80. | 80–89. | 90–100. | |
| Perennial rye-grass— | | | | | | |
| All samples .. .. | 1·5 | 79 | 41 | 21 | 38 | 1,649 |
| Poverty Bay .. | 2·3 | 81 | 30 | 8 | 62 | 59 |
| Hawke's Bay .. | 2·3 | 94 | 2 | 2 | 96 | 232 |
| Manawatu .. .. | 0·9 | 63 | 82 | 13 | 5 | 115 |
| Canterbury .. .. | 1·6 | 91 | 11 | 18 | 71 | 229 |
| Southern .. .. | 1·2 | 72 | 57 | 30 | 13 | 843 |
| Italian rye-grass .. | 0·2 | 87 | 24 | 16 | 60 | 210 |
| Western Wolths rye-grass | 0·2 | 84 | 21 | 17 | 62 | 113 |

*Table 6.—Average Percentage of Purity and Germination Capacity of Clovers and Related Species.*

| | Purity Percentages. | | | | Germination Capacity. | | | | Percentage of Hard Seed. | Average Percentage of Pure Germinating Seed. | Number of Samples. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Pure Seed. | Other Crop Seed. | Weed Seed. | Inert Matter. | Percentage of Samples germinating in Groups. | | | | | | |
| | | | | | Average. | Below 80. | 80–89. | 90–100. | | | |
| White clover— | | | | | | | | | | | |
| All samples .. .. | 88·3 | 9·2 | 1·5 | 1·0 | 82 | 34 | 31 | 35 | 9 | 72·0 | 400 |
| Certified .. .. | 91·2 | 6·8 | 1·0 | 1·0 | 81 | 42 | 41 | 17 | 14 | 72·1 | 12 |
| Uncertified .. | 88·9 | 9·5 | 1·6 | 1·0 | 82 | 33 | 31 | 36 | 9 | 73·4 | 380 |
| Imported .. | 97·6 | 1·0 | 0·8 | 0·6 | 63 | 82 | 12 | .. | 10 | 61·5 | 8 |
| Red clover— | | | | | | | | | | | |
| All samples .. | 98·0 | 0·5 | 0·8 | 0·7 | 85 | 19 | 21 | 60 | 4 | 83·7 | 307 |
| New Zealand .. | 98·0 | 0·5 | 0·8 | 0·7 | 87 | 19 | 21 | 60 | 4 | 85·0 | 301 |
| Imported .. | 98·5 | 0·1 | 0·7 | 0·7 | 59 | 68 | 16 | 16 | 5 | 57·7 | 6 |
| Alsike .. .. | 97·5 | 1·8 | 0·3 | 0·4 | 78 | 43 | 16 | 41 | 6 | 73·5 | 61 |
| Subterranean clover | 99·1 | tr. | tr. | 0·8 | 76 | 59 | 29 | 12 | 18 | 75·0 | 17 |
| Strawberry clover .. | 98·9 | 0·4 | 0·3 | 0·4 | 83 | 34 | 44 | 22 | 11 | 82·0 | 9 |
| Crimson clover .. | 98·8 | 0·1 | 0·1 | 1·2 | 76 | 27 | .. | 73 | Nil | 83·1 | 11 |
| Suckling clover .. | 83·4 | 11·5 | 4·3 | 0·8 | 65 | 84 | 13 | 3 | 19 | 54·7 | 30 |
| Lucerne .. .. | 99·0 | 0·4 | 0·2 | 0·4 | 76 | 60 | 21 | 19 | 15 | 75·0 | 121 |
| Trefoil .. .. | 98·5 | 0·2 | 0·3 | 1·5 | 73 | 65 | 20 | 15 | 3 | 74·3 | 20 |
| Lotus major .. | 93·7 | 5·0 | 0·8 | 0·5 | 80 | 29 | 52 | 19 | 5 | 72·6 | 48 |

*Table 7.—Number and Percentage of Samples of Rye-grass classified by Ultra-violet Light Examination.*

| Classification. | Seed Trade. | | Farmers. | | Total. | |
|---|---|---|---|---|---|---|
| | Number. | Percentage. | Number. | Percentage. | Number. | Percentage. |
| A 1 .. | 54 | 27 | 15 | 22 | 69 | 25 |
| A 2 .. | 72 | 36 | 18 | 27 | 90 | 34 |
| A 3 .. | 25 | 12 | 11 | 16 | 36 | 14 |
| B 1 .. | 18 | 9 | 12 | 18 | 30 | 11 |
| B 2 .. | 5 | 3 | 3 | 5 | 8 | 3 |
| B 3 .. | 12 | 6 | 6 | 9 | 18 | 7 |
| B 4 .. | 14 | 7 | 2 | 3 | 16 | 6 |
| Total .. | 200 | .. | 67 | .. | 267 | .. |

### CEREALS, VEGETABLES, FIELD ROOTS, ETC.

The average germination capacity for these classes of seeds was as follows :—

*Cereals, &c.*

| | Per Cent. | | Per Cent. | | Per Cent. |
|---|---|---|---|---|---|
| Oats | 77 | Rye-corn | 65 | Blue lupin | 60 |
| Wheat | 93 | Tares | 79 | Flax (*Linum*) | 97 |
| Barley | 55 | Japanese millet | 94 | | |

*Vegetables.*

| | Per Cent. | | Per Cent. | | Per Cent. |
|---|---|---|---|---|---|
| Asparagus | 53 | Cress | 85 | Parsnip | 68 |
| Beet | 74 | Cucumber | 92 | Peas | 91 |
| Bean | 93 | Lettuce | 91 | Parsley | 63 |
| Broccoli | 76 | Leek | 83 | Radish | 85 |
| Brussels sprouts | 94 | Marrow | 68 | Rhubarb | 65 |
| Carrot | 66 | Melon | 85 | Spinach | 53 |
| Cauliflower | 83 | Onion | 77 | Squash | 68 |
| Celery | 74 | Pumpkin | 77 | Tomato | 95 |

*Root Seeds.—Field Roots and Forages.*

| | 1932. Per Cent. | 1931. Per Cent. | | 1932. Per Cent. | 1931. Per Cent. |
|---|---|---|---|---|---|
| Swede | 85 | 82 | Kale | 86 | 84 |
| Turnip | 91 | 90 | Mangel | 80 | 80 |
| Rape | 92 | 92 | Carrot | 66 | 71 |

The assistance of Mr. J. Watt, of the Seed-station staff, in the preparation of the tabulations used in this report is cordially acknowledged.

## STRATFORD DEMONSTRATION FARM.

### NOTES ON THE 1932–33 SEASON'S OPERATIONS.

J. M. SMITH, Instructor in Agriculture, New Plymouth.

THE bright spot in farming operations during last season in Taranaki was the wonderful weather conditions experienced. A good spring was followed by a moderate summer with a well-distributed rainfall, and this in turn was followed by an autumn that more resembled a normal spring. Pasture growth was more evenly maintained than had previously been the case, there being an early growth, a less rapid growth during the late spring and early summer, and a moderate long-drawn-out growth during the autumn. Doubtless the season had much to do with this, but the earlier use of phosphatic manures probably also had its effect. Basic slag was used over the greater part of the farm in February and March in the preceding season, and a certain amount of lime and superphosphate was used during June.

In accordance with the policy of limiting the area in crop to a minimum, only 7 acres were in supplementary fodder crops, these being 2 acres of mangels, 2 acres of soft turnips, 2 acres of swedes, and 1 acre of carrots. The 2 acres in swedes was an experimental

area in connection with club-root control, and as the results were entirely negative—the crop being wiped out with this disease—the actual total area in feedable fodder was only 5 acres.

Other fodder to supplement the pastures was grass silage saved from 40 acres and meadow hay from 22 acres. The silage was all saved in pits, there being one concrete pit 20 ft. in diameter by 14 ft. deep, and two earth pits, the sizes being 18 ft. in diameter by 20 ft. deep, and 18 ft. in diameter by 10 ft. deep respectively. The concrete pit is very satisfactory both as regards labour saving and waste reduction, but while the same efficiency is experienced with the earth pits in regard to labour the waste is rather excessive. There is no doubt that the lack of a roof and the crumbling walls are responsible for this.

The type of silage made was good, and it is interesting to record that the reports on all the milk supplied to the factory have been satisfactory. The health of the stock has also been good.

Various standard manurial trials that have been going for several years were again repeated, despite the necessity for easing up with this type of work. One of the most interesting paddocks is Field 4, which area has now been top-dressed with basic slag annually for the past ten years, and is to-day undoubtedly the best paddock on the farm. The sward is strong in rye-grass, and is nicely balanced both as regards clovers and other good grasses. With regard to potash, there was a slight indication of benefit in one paddock, but this was hardly definite enough to be positive evidence.

A feature of the season's operations was the increased amount of light tripod harrowing carried out. This certainly has resulted in a more even pasture growth, and indications are that the time spent in this work was well worth while.

The practice of running a small flock of sheep in conjunction with the dairy herd was continued, and fifty ewes constituted the flock. These are used principally to clean up after the milking cows, and to graze the rougher portions of the farm. The benefit has been amply demonstrated, particularly in the weed control of the pastures. With a lambing percentage of 140, and the amount received for the wool, the flock constitutes a fair source of revenue.

Sixty-one cows constituted the herd, and the butterfat supplied to the factory was 17,294 lb., which works out at 283 lb. per cow and 123 lb. per acre. According to the testing records, the butterfat amounted to 18,762 lb., or 307 lb. per cow and 134 lb. per acre. It should be pointed out that certain sales of milk represent the main difference between these two figures.

One of the main works carried out during the season was the completion of the planting of all permanent fence-lines with barberry. This should mean a great saving in fencing maintenance in the future. A further sidling was also planted out for shelter.

The farm staff did particularly good work during the season. For two men to handle all the work entailed by the herd, flock, and pigs on 142 acres, to keep the farm fully maintained, and to carry out the whole of the cropping and the bulk of the harvesting was no small job, and deserves full credit.

# SEASONAL NOTES.

## THE FARM.

### Method of Effective Summer Grazing in Dairying.

ON many farms the cost of production of butterfat could be reduced substantially by the adoption of more efficient measures in the summer utilization of pastures. One of the more important of these measures is improved grazing management.

In view of the fact that during recent years recommendations about methods of efficient grazing have at times differed in points of practical moment, it seems well to state that often improved grazing would involve useful amendments to common practice, but would not involve any radical departure from it or any material additional outlay. Some farmers have gained the impression that the improved grazing which is being advocated is relatively complicated and difficult, and calls for attention and outlay which they cannot see their way to provide. Because of this, while they realize that their present methods are far from perfectly efficient, they are deterred from attempting to improve those methods. In many cases in which a small inexpensive further effort would give much improvement, this is unfortunate.

Effective grazing management may be achieved by (1) alternate spelling and even, but not really hard, grazing during spring and early summer of those fields required to meet adequately the feed needs of the stock; (2) the immediate elimination, as far as is possible safely, from the grazing programme of all grassland additional to that required for the current needs of the stock—frequently poor results originate in failure to do this.

While no hard and fast rules constituting detailed guidance, and suitable for general application, can usefully be framed, the method of effective grazing management may be indicated in a general way by considering the practice on certain farms on which the standard of grazing efficiency is much higher than the average standard of the neighbouring farms. It is found that quite satisfactory results are obtained without carrying out really close grazing during spring and summer. It is customary to remove the stock from a field when there is still fresh feed on it. There is no attempt to achieve by hard grazing the appearance that would result from mowing. The periods of spelling are relatively short, and consequently the grazing periods are correspondingly short—grazing periods of one to two days, separated by spells of six to eight days, frequently giving good results. The intensity of stocking desirable necessarily varies with the nature of the grassland. Quite good results have been associated with stocking at the rate of six to eight dairy cows to the acre, but possibly at times better results would be obtained if heavier stocking were practised. Ensilage and haymaking are exploited to the fullest possible extent in handling surplus feed produced during the period of rapid growth of grassland, and any surplus growth in addition to that dealt with in ensilage and haymaking is topped with the mower, which as a rule is manipulated so that it cuts practically nothing but flower stalks. Grass harrowing is looked upon as essential, though it by no means becomes a heavy task: it has been confined to two or three harrowings a year, and it seems that it could at times with advantage be carried out more frequently.

Because of the probable variation in the size and productivity of fields on the same farm, any fixed system of rotating the grazing of a series of

paddocks for equal periods in a given order is very likely to break down in practice. Hence the term "rotational grazing" is apt to be misleading in its implication unless it is understood that a practical system of grazing management calls for flexibility in its operation. It is likely, for instance, to be found advisable to graze or to spell certain fields longer than neighbouring ones, and, on account of surplus feed, to drop fields which it was intended to retain under grazing. The essential matter is to graze fields not according to a determined routine but according to their stage of growth, selecting for grazing the stage fitted to give best results, having regard both to the stock and the pastures.

Five facts of considerable practical importance are worthy of mention in respect to grazing, broadly along the lines described above:—

(1) There is no call for punishing treatment of stock in milk; stock are moved to a fresher pasture as soon as the one they occupy is in danger of becoming stale.

(2) There is no necessity for the use of store stock as "followers" of milking stock in the manner which has been so widely advocated overseas, and at times in New Zealand, as necessary to success in grazing control. But if store stock are available in sufficient numbers they may at times be employed advantageously to consume either coarse growth developing round droppings (especially when harrowing has been scant) or the mown material resulting from topping.

(3) The advent of a dry summer or autumn period is not an occasion of so much danger as in a system which involves periodical hard summer grazing of fields.

(4) The abstinence from periodical hard grazing minimizes the injury to valuable pasture plants, and lessens the period occupied in recovery and return to the stage of maximum rate of growth. Each severe defoliation, such as is involved in hard grazing, means a setback to the plant, with a fall in its rate of growth, and if heavy defoliation is repeated often enough the plants decline in vitality and activity. Evidence of this has been provided recently in an investigation relative to the influence of the type of grazing upon root development. The root development on a mixed sward which had been lightly grazed was 148 per cent. the weight of that of one which had been heavily grazed; the root system of lightly grazed cocksfoot was 216 per cent. the weight of cocksfoot which had been heavily grazed; the root system of lightly grazed perennial rye-grass was 124 per cent. the weight of that which was heavily grazed.

(5) There is no necessity for an abnormal degree of subdivision; the unusually small and numerous paddocks which have at times been suggested are not required. Quite good results in grazing of average to good quality dairy pastures have been obtained on farms containing from nine to twelve paddocks, exclusive of small ones used for pigs, calves, &c. Possibly at times closer subdivision would have facilitated greater efficiency in grazing, but the results obtained on farms consisting of nine to twelve paddocks suffice to indicate that on many farms the efficiency of grazing is not limited by insufficient internal fencing.

Evidence of poor spring and summer grazing management persists into the autumn in the form of patches of rough, unrelished growth, and a relative abundance of flower heads. Good summer grazing has been practised when patches of rough growth and the development of flower stalks have been reduced to a minimum. Grazing in the manner outlined above by itself usually will not suffice to give this result—it must be associated with adequate ensilage or haymaking, harrowing, and often with topping. Probably poor pasture management arises most commonly because of insufficient ensilage—a greater area than is needed is kept under grazing, and when this is so, it is virtually impossible to secure good control

of pastures. Actually, as soon as it is clear that an area is providing surplus feed it is generally wise to drop it from the grazing programme, even though there may be practical difficulties in harvesting it for silage.

As the value of grass harrowing as an agent in pasture control has been widely demonstrated, it is probable that it would be more thoroughly and widely practised were farmers always mindful that harrowing may usually be done as a routine job by the labour regularly employed, and that when the harrows and the power to draw them are available, as so often is the case, no additional outlay is required.

### Special Crops to supplement Pastures.

In districts which this year have experienced a favourable winter and spring, butterfat production during August is stated to have increased 40 per cent., and even more at times, in comparison with the previous August; sheep and lambs show an improvement, and the incidence of stock disorders apparently shows a falling off. These results would seem to be associated intimately with an abnormally bountiful natural supply of feed. It is of practical moment at this season to bear in mind that nature is not usually so kind. The value of supplies of winter and spring feed greater than are usually provided having been clearly demonstrated this season, it would be against the dictates of prudence not to take definite steps to secure a correspondingly good supply of feed for future seasons, even though they be normal and not unusually favourable ones.

One important means of providing additional winter and spring feed is, as recommended above, by more fully exploiting ensilage and haymaking. Another important means is the growing of special crops. The greater demand, in districts in which grass-farming is dominant, for horses for general farm work seems a healthy sign that it is being more fully realized that increased special cropping to supplement pastures is generally advisable.

Apart from their intrinsic worth as a means of augmenting the feed-supply during seasons of scant pasture growth, special crops on the great majority of farms serve as a decidedly useful intermediate step in the economic replacement of swards of a poorer type than could be secured by reasonably efficient management. It seems at times to be overlooked that relatively recent developments often open up the possibility of permanent pastures superior to those which generally would have been considered satisfactory in the past; that suitable exploitation of improved strains of permanent-pasture plants, which have been made available commercially by the system of official certification of seeds, when associated with judicious top-dressing, tends to beget more productive and profitable pastures, and that on many farms the freer production of special forage crops would hasten desirably the establishment of the better pastures that are possible.

Sometimes, but not often, the labour position on a farm makes questionable the advisability of increasing the amount of special cropping. For instance, if the current work on a farm fully occupies those employed on it and additional special cropping would necessitate an additional worker, then the additional cropping may not be economically sound, but it is generally advisable to grow crops such as mangels, carrots, lucerne, chou moellier, &c., when this can be done without creating the need for any considerable direct outlay in labour or equipment. And this will be true as a rule even of farms the pastures of which are not badly in need of renewal.

### The Mangel Crop.

A substantial increase in the area of mangels annually grown in the Dominion would be profitable. When pollard costs £6 15s. a ton the mangel is worth 15s. a ton; when pollard costs £4 10s. a ton the mangel is worth

10s. a ton in comparison with the pollard. Over wide areas efficient mangel-growing will result generally in yields of 50 to 70 tons an acre; in the 1932–33 farmers' field competitions 54 crops averaged over 70 tons an acre, and in the four years ending with the 1931-32 season 310 crops averaged approximately 57 tons an acre. The mangel is particularly dependable because it is subject to no serious disease or pest, and because, given reasonably good treatment, it fares relatively well through a dry period. The variety Prizewinner Yellow Globe, holds pride of place in popularity and in results—it is markedly prominent in the prize lists of the several competitions. Other varieties of known value are Red Intermediate, White Sugar, and Jersey Queen. Current standard practice is to sow about 6 lb. of seed an acre in rows 26 to 28 in. apart; at times high yields are associated with narrower rows—*e.g.*, 20 to 22 in. apart, and with heavier seedings; last season an 8 lb. seeding resulted in a crop of over 100 tons to the acre, the roots, though not exceptionally large, being uniformly and closely spaced in the rows. Cold, wet conditions tend to cause loss or stunting of seedlings, and so sowing should not take place before warm soil conditions may be expected; over wide areas November sowing is suitable.

Good treatment for the mangel is specially necessary, and if the likelihood of giving the crop such treatment seems small, then an alternative less exacting crop should be grown; but the mangel responds so profitably to good treatment that it should be grown if it is at all possible to meet its needs.

Preparatory cultivation should give a fine, firm seed-bed, and to do this effectively and economically the work should be in progress well ahead of seed sowing. One of the most important potential benefits from subsequent cultivation is the checking of the escape of moisture from the soil into the atmosphere, as much as possible, except through the leaves of the crop. Moisture is freely lost from the soil by evaporation from its surface. This loss is reduced if the surface layer of soil is kept loose by making surface cultivation frequent and thorough enough. Soil moisture is also lost on account of the activity of weeds which cultivation controls. The importance of conserving for the use of the mangel as much as possible of the soil moisture may be gauged from the fact that the equivalent of 30 to 40 in. of rainfall passes through the leaves of an acre of a crop yielding 60 to 80 tons an acre.

The manurial needs of mangels vary with soil and climatic conditions, but field experience has shown that over wide areas good results may be expected from a dressing of 5 to 6 cwt. an acre of a mixture consisting of equal parts of superphosphate and blood and bone, or three parts of superphosphate to two parts of blood and bone. Further, although exact data which would justify a general conclusion are not available, it is widely believed that such a mixture could often well be supplemented by broadcasting before seed sowing a dressing of about 3 cwt. an acre of kainit or of agricultural salt. The former, which contains about 14 per cent. of potash as well as a considerable amount of salt, should be used when there is some evidence that the mangel crop would benefit from the potash as well as from the salt.

### Lucerne.

As a fine, firm, seed-bed is most favourable for successful establishment of lucerne, preparatory cultivation should be early and thorough. Apart from exceptional conditions, such as occur in a sandy soil subject to a very dry summer spell, there is as a rule no advantage in sowing before the latter part of November or December. On the other hand, early sowing associated with cold soil conditions may lead to weakly seedlings of such slow development that they are poorly fitted to compete against weed seedlings. Successful results commonly follow from sowing 12 lb. to 18 lb. an acre of seed, of Marlborough origin, through every coulter of the grain drill.

Satisfactory results may be expected from broadcasting the seed and covering it by light harrowing. Liming is as a rule advisable, and when it is so, may be carried out advantageously before the final cultivation preceding seed sowing.

The Department's Bulletin No. 155 contains considerable further information about lucerne culture, and is available free.

### Ensilage Points.

Common and important faults in the practice of ensilage may be summarized as follows :—

(1) Inadequate consolidation of the green material in pits and trenches, leading to avoidable wastage as a result of decay at the sides ; the more mature and stemmy the green material the greater the need for specific measures to bring about consolidation. The weight of workers and of equipment can at times be made to serve usefully for effecting suitable consolidation.

(2) Harvesting when the herbage is too mature, which leads to the following undesirable results : (*a*) unnecessarily woody silage, which as a feed is characterized by all the disadvantages attaching to overmaturity in pasture growth ; (*b*) less likelihood of a heavy leafy aftermath available in the latter part of summer, when it is usually acutely needed ; (*c*) avoidable injury to the pasture, due to the unnecessarily prolonged shading effect of the tall growth.

(3) Development of excessive temperatures in the material, leading finally to silage of dark brown to black colour, instead of the greenish to light brown colour which is indicative of better feeding value. The high temperatures which lead to the dark colour are held to bring about not only an avoidable wastage in material, but also a substantial falling off in quality due to a disproportionately heavy loss of digestible protein.

(4) Inadequate covering of the stored silage with material weighty enough to reduce the air in the material as much as possible ; the covering is specially likely to be insufficient round the sides.

Further information about ensilage is contained in Bulletin 146, obtainable on application.

—*R. P. Connell, Fields Division, Palmerston North.*

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## THE ORCHARD.

### Seasonal Spraying.

LAST month's notes dealt with suitable sprays recommended for the particular period of the year or stage of growth of the trees. The latter is a very important point in so far as spray application is concerned ; the need of applying the correct mixture at the correct time cannot be overstressed. Each orchardist should keep a record of the date of the various stages of growth of the trees in his orchard—say, from bud-movement to fruit-set. Such a record would prove invaluable from a disease and pest control point of view ; it would also enable him to have everything, including the specific, in readiness for immediate action several days prior to actual use.

With the advance of spring each year, nature arouses from their winter dormancy the various insect pests and fungi spores. The first stage of this activity takes place shortly after or about bud-movement, and continues until well into the following autumn. Perhaps the most dangerous period from infection, so far as black-spot, powdery mildew, brown-rot, and leaf-curl are concerned, is from pre-pink to shortly after fruit-set. This is also a dangerous period as regards the first attack of insect pests on the tree parts, for it is between the above-mentioned stages of growth that red-

mite, leaf-roller caterpillar, apple-leaf hopper, codlin moth, pear-slug, and the various scales first become active, while about the end of October or early November the bronze-beetle may be expected to appear. Many of these, both fungi spores and insect pests, are incubated in the ground, from which they subsequently emerge.

It is not suggested that the danger from attack of fungi and insect pests ends with the setting of fruit. The danger of attack from one or other, or both, is always present during the growing season, and even after the fruit has been harvested, under certain circumstances, there is still a danger from black-spot and brown-rot infection.

An application of the combination spray at petal-fall, as recommended in last month's notes, should act as a sufficient protection against the onslaught of fungi diseases and insect pests for ten to twelve days, according to climatic conditions. Should it prove otherwise, probably the fault lies with the operator, not with the specific or specifics as the case may be. The actual period between sprays should be regulated according to the weather conditions peculiar to the individual district. During the ten to twelve days after petal-fall the calyx will have closed, and the embryo fruit will be in evidence. At this stage the second application of the combination spray for control of black-spot, powdery-mildew, codlin-moth, and other chewing insects, should be applied—*i.e.*, lime-sulphur 0·1 per cent., plus colloidal sulphur 2 lb. and arsenate of lead 1½ lb. powder (or 3 lb. paste) per 100 gallons water. This combination can be taken as a standard spray, and should be applied every fourteen to eighteen days until mid-December, after which date the lime-sulphur strength should be reduced.

It is important that lime-sulphur be diluted according to its polysulphide content; therefore when making up a 0·1 per cent. mixture, if the polysulphide content of the particular brand is "12" the correct dilution is 1 gallon lime-sulphur to 120 gallons water; if "15," the correct dilution is 1 gallon to 150 gallons water; if "18," the correct dilution is 1 gallon to 180 gallons water, and so on. It is unwise to use a lime-sulphur the polysulphide content of which is unknown.

*Stone Fruits.*—Practically all stone fruits will be at fruit-set by this time. At this stage there is little or no danger from leaf-curl or bladder-plum infection, but it is essential that the tree parts be kept well protected from an attack of brown-rot, shot-hole, and leaf-rust. For the control of such, continue with the combination spray as directed in the last July notes—*i.e.*, lime-sulphur 0·083 per cent., plus colloidal sulphur 2 lb. per 100 gallons water. For the control of insect pests spray as directed in last month's notes.

**Fireblight.**

Fireblight infection may become noticeable about the end of the current month or early November. The first signs of infection is a wilting of the blossom and the leaves on the blossom spur, and this is followed by a change of colour of the young fruits to brown or black. From this stage infection will probably spread to the laterals and branches on which cankers may be formed. Control measures consist in removing infected parts by cutting well below visible infection, and immediately burning all diseased parts.

Primarily infection is through the blossom, and where such infection occurs it is obvious that there is a source of infection to be found somewhere in the district—*i.e.*, hold-over cankers. It must be remembered that one hold-over fireblight canker is capable of reinfecting a whole district in a few weeks through the medium of insects, bees, &c. Such insects become contaminated with fireblight bacteria by visiting an oozing canker, when after such a visit it is only a matter of minutes or hours before the organism is carried to the blossom into which it is inoculated.

In districts where fireblight is known to exist every fruitgrower and fruitgrowers' association should be prepared to sacrifice time and (if

necessary) money with a view to locating and destroying, by burning, every source of fireblight infection. It is not sufficient, however, to be satisfied with a searching examination of the orchards, as hold-over cankers will not necessarily be found there, but probably on a hawthorn, apple, pear, quince, or medlar growing in some isolated position. The question of not being able to afford time and money for such work should not for a moment enter into the question, for no fruitgrowing district can afford to risk the menace of fireblight infection by leaving hold-over cankers to spread their destructive organisms at will.

### Cultivation.

It is presumed that thorough cultivation has now been carried out in all well-managed orchards, and the soil reduced to a fine tilth. This being so the harrows should be kept in constant use with a view to conserving the moisture, keeping down weeds, &c., and making available the plant nourishment necessary for the development of fruit and growth generally.

—*J. W. Whelan, Orchard Instructor, Palmerston North.*

### Citrus Culture.

At this period of the year, with the spring rains, cultivation should be carried out whenever possible, but care must be exercised so that the feeding roots close to the surface are not damaged.

As soon as the main crop of blossoms is set and the young lemons appear, spraying with bordeaux 4–4–40 should be carried out as a protection against verrucosis, and if any older fruits show signs of the disease they should be removed and destroyed. All fruits which have developed to 2½ in. in diameter should be picked, irrespective of colour, so as to allow of the development of the new season's crop.

Where bark-blotch and collar-rot are in evidence attention should be given to the trees right away, and where the disease has not made any great headway careful removal of the diseased portions of the bark, along with a small portion of the healthy bark, afterwards painting the wounds with bordeaux paste followed by coal tar, will help the trees to get back into a healthy condition.

Where the effect of young borer is noticed, by the withering of the leaves on a twig, the immediate removal of the infected twig and destruction of the grub will prevent its penetration to larger limbs and trunk; but should they also be infected, inject benzine into the holes and plug with soap.

A close watch should also be kept for scale and thrips, and where infection has taken place a white oil spray at a strength of 1–35 to 1–80 should be applied late in January or during February.

Any budding necessary may be done during October or early in November, or be deferred until the bark lifts freely in the autumn.

A misprint occurred in the last line of these notes in the September *Journal*, where nicotine sulphate "1–1800" should read "1–800."

—*L. Paynter, Orchard Instructor, Auckland.*

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## POULTRY-KEEPING.

### Control of Insect Vermin.

WITH the approach of hot weather these natural enemies of poultry make their appearance. The best way to fight these pests is to prevent them from getting a foothold, and November is a good month for this to be done most effectively. The wise poultry-keeper never allows vermin to make its appearance, particularly in the case of red mites. He realizes

that, whether they are in large or small numbers, they mean a steady drain on his profits, for the laying hen cannot be expected to produce her maximum egg-yield or the young stock make sound development if nightly tortured by blood-sucking insects.

It must not be concluded that because red mite cannot be seen during the day it is not present. The mites hide during the day in secluded places and attack the birds by night, and owing to this habit it is to be feared that too often they are responsible for much worry and loss to the poultry-keeper while escaping his observation. The only way to make sure that a house is free from red mite is to dig into the cracks and hiding-places, particularly near the roosting quarters, with a pen knife. If the dust, &c., is collected on a piece of white paper the mites will be readily seen if present. Strict attention to cleanliness, and frequent spraying with a strong disinfectant, are the first essentials towards keeping the quarters free from those insects which do not live constantly on the fowls.

Body lice, however, will not be overcome by any spraying, and powdering individual birds is out of the question on a large plant. The best method of dealing with lice is by applying nicotine sulphate (a by-product of tobacco) to the perches. A good way of doing this is to make a small hole in, say, a cocoa tin, leaving a thin line of the liquid on the perch. Do this at dusk just when the birds are going to roost. If there is much dust on the perch the liquid is apt to run off and become wasted, and to prevent this it is a good plan to first rub the perches over with a damp cloth. If this is done the liquid can be more easily applied to the centre of the perch, and the risk of wastage will be reduced to a minimum. The treatment should be repeated in about ten days, after which time the birds should keep fairly free from the vermin for about three months.

**Farm Poultry-keeping and Co-operation.**

The increasing number of inquiries received from the farming community for poultry literature published by the Department, as well as inquiries by letter for detailed advice connected with the management of poultry, suggests that more farmers, or at least the womenfolk on the ordinary farm, are taking a greater interest in their poultry flocks than probably ever before.

As further evidence of this, certain women's organizations in the Dominion are taking advantage of the assistance given by the Department of Agriculture to further the poultry industry. The aim of these organizations is to make arrangements in various districts whereby any women interested in poultry-keeping may be afforded an opportunity of attending lectures and demonstrations by the Poultry Instructors. No doubt the spread of the movement throughout the country districts would not only tend to increase the knowledge of how to manage poultry on proper lines, but also to improve the quality of poultry products and bring about a better system of marketing than the crude methods which generally exist to-day.

It is very satisfactory to know that farm womenfolk are among those responsible for instituting the organizations referred to, and are taking full advantage of the opportunities afforded for gaining practical knowledge relative to the management of poultry. The interest created in the districts where lectures and demonstrations have been given is evidenced by the fact that requests for the Department's Bulletin No. 66, "Utility Poultry-keeping"—which contains the writer's comprehensive advice on poultry matters—are particularly frequent, while inquiries for the Department's utility stock and eggs for hatching purposes are on the increase. Moreover, visits to the Wallaceville Poultry Station by farm women, for the purpose of observing the application of practical knowledge in all branches of poultry management, are more numerous than ever before.

What these women's organizations should aim at now is co-operative action among the producers whereby poultry products may be disposed of in proper condition to the mutual advantage of producer and consumer, and, above all, to assist the present organized bodies to export any surplus eggs.

Obviously, when the supply of eggs exceeds the demand of the local trade, as it does now, exportation of the surplus to overseas markets is imperative if the producer is to receive a profitable return for his labours. Already the great bulk of the eggs produced in the Dominion come from the farm, and this will continue to be so; but, unfortunately, on too many farms the fowls are not returning the value they should. The chief weakness lies in allowing the birds to lay anywhere—just as they are allowed to roost where they please—and in collecting the eggs from odd corners and fences when convenient, with the result that their freshness can seldom be depended on.

At the present time the local consumer is generally catered for in anything but a proper manner. Usually the market rates for eggs are based on the doubtful article rather than on special quality, and consequently the consumption of eggs is retarded. If all eggs were graded for size and cleanliness, tested for quality, and sold according to their weight, a greater demand would be created on the local market and increased prices would result. It is useless, however, discussing further these and other desirable and necessary reforms for the welfare of the industry until poultry-keepers, both large and small, realize the urgent necessity of better organization.

The New Zealand Poultry Association, which has chiefly consisted of commercial poultry-keepers and those who conduct the business on a fairly large scale as a side-line, has undoubtedly rendered great service for the betterment of the poultry industry. It has been endeavouring to organize poultry-keepers for over twenty years, but unfortunately it has not attained the necessary degree of advancement in this respect. The Association realizes that it would be an impossible task to organize the industry under purely voluntary conditions, and that if the desired ends are to be achieved some form of controlled co-operation is imperative. With this in mind, it has been instrumental in inducing the Government to introduce legislation as a first step under which all poultry-keepers who keep twenty-five fowls or more, and who sell eggs, would be required to register. It is generally conceded by those engaged in the industry, and particularly those who have given mature thought to the principles underlying the proposal, that if made law it would be in the interests of producers, consumers, distributors, and the country as a whole.

Comparisons are frequently drawn between the extent of the egg-export trade in Australia and New Zealand. What has been accomplished in the former country calls for congratulation, but it is safe to assume that Australia could not possibly have increased her export in eggs from 1,104,005 dozen in 1927 to 16,506,190 dozen in 1932 in the absence of some form of control.

There are special features connected with the poultry industry which, unfortunately, are usually not understood by the average person. Many people gauge the value of the industry to the Dominion by the number of persons engaged therein as a sole means of livelihood. In New Zealand, as in all other countries, the great bulk of the eggs and table poultry is produced as a side-line by ordinary farmers and small holders, the average flock here numbering approximately two dozen. For this reason it is often thought impossible for the owners of these small flocks to take part in the egg-export trade. This, of course, is wrong, as the co-operative system provides an effective means for all.

*—F. C. Brown, Chief Poultry Instructor, Wellington.*

# THE APIARY.

### Considerations of Location.

PERHAPS there is no more important question to the beekeeper than location. Upon his ability to select a suitable district in which to start beekeeping will depend his future success. There are few districts in the Dominion where bees cannot be kept in small numbers, but the successful establishment of a commercial apiary will largely depend upon knowledge of the nectar-secreting plants. It is generally recognized that the main nectar-flow in New Zealand is produced from white clover and catsear, but it will be found a distinct advantage if the apiary is established in a district near patches of native bush or where the golden willow is abundant. Most of the indigenous trees and willows flower early, and the nectar from these sources is very valuable, as it provides stores in the spring.

In districts where dependence has to be placed entirely upon white clover a careful watch must be kept on the stores, and very often artificial feeding has to be resorted to in the spring and carried on until the appearance of the clover bloom. This is often expensive, and can be usually avoided by selecting a site where at least a moderate spring flow may be anticipated.

The rich dairy pastures of both the North and the South Islands, and localities where cattle-raising is carried on extensively, provide suitable sites for commercial apiaries. Country which is used for sheep-grazing is not profitable, as the clover pasture is usually eaten bare. Instances have come under my notice where abnormal crops have been secured in purely sheep-country, but they are too infrequent to be taken into consideration, and consequently this class of country should be avoided. Essentially the main requirements are feed and shelter, and if the apiarist is fortunate enough to locate his bees in a position where there is an abundant supply of nectar-secreting plants good shelter can be easily provided.

### Water Supply.

In the absence of a natural supply, water should be provided. Bees require a good deal of water for brood-rearing throughout the whole season, and it often happens that numbers are lost if water is not close at hand. Moreover, bees often become a nuisance at cattle-troughs and by congregating round domestic supplies. Where a large number of colonies are kept it is imperative to see that the bees are well supplied. Many contrivances are used. "Simplicity" feeders make excellent vessels for containing water, but they require to be filled frequently and be occasionally cleansed. Bees prefer to take water from damp situations, and they may often be noticed in numbers sucking water from the ground where there has been any overflow. Feeders should be placed in a sheltered spot in the apiary.

### Artificial Increase.

Artificial increase may be accomplished in several ways, but perhaps the most satisfactory is by means of nuclei and division. A nucleus is best formed of two frames of emerging brood and young bees, one frame of honey and one containing pollen. This must be completed by a virgin queen or a ripe cell. The nuclei may be utilized throughout the season for the mating of queens for renewal, and at the end of the summer, if two or more are united, or if each one is reinforced by the addition of bees and brood from strong colonies, they may be wintered in safety and will form good stocks for the next season. No surplus can be expected from them in the year of their installation.

In dividing it is best to wait till the colony is preparing to swarm and ripe queen-cells appear in the hive. The hive can then simply be split in two by putting half the bees and brood on another stand, taking care to

leave queen-cells in each division, and for preference putting as much emerging brood in the half which is to be placed in a new position. This latter precaution is necessary in order to make up the wastage from the field-bees that will return to the old stand. Each hive can then be completed by filling the vacancies by drawn-out combs. The queen-cells in the queenless half will be nursed by the young bees, while those in the half containing the queen will be torn down by the bees when they find the hive depleted. If the apiarist wants to be quite sure of this being done he may search for the queen and remove her while the division is being made, afterwards putting her in the hive on the new stand.

The division method is advocated on account of its simplicity and the fact that there is no necessity for finding the queen before the operation. It is a most effectual preventive of swarming, and saves a great deal of trouble where increase is desired.

*—E. A. Earp, Senior Apiary Instructor, Wellington.*

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# HORTICULTURE.

### Vegetable Crops.

In order to produce clean strong celery plants it is usually necessary to spray the plants in the seed-beds with bordeaux, 3–4–50, to protect them from the attack of the leaf-spot fungus, *Septoria apii*, which is all too common. Burgundy mixture, in which washing soda takes the place of lime, is sometimes used in place of bordeaux, and is preferable for later applications, as it causes less discoloration. Treatment for the prevention of this disease, which is the most serious of those attacking celery crops, was fully described on pages 289–92 of the May issue of the *Journal*.

Unless the ground is naturally of a moist character, or irrigation can be arranged by means of furrows or an overhead sprinkler system, the celery crop must be grown in trenches to facilitate watering. These should be prepared in ample time, so that they may mellow and settle before planting is done. A trench for this purpose is usually 18 in. wide and about 1 ft. deep: it is filled, to within 3 in. of the top, with a rich mixture composed of a friable loam and well-decayed manure to which has been added about 1 oz. each of superphosphate and sulphate of potash to every 3 yards of trench. The surplus soil from the trench should be laid in a ridge on each side, and used later for moulding up the crop when blanching.

Seed-beds of savoys, cauliflower, broccoli, &c., are liable at this season to the attack of the caterpillar larvæ of the diamond-back moth, as well as in many districts to those of the white butterfly. The heart of the tender plants is also a favourite feeding-ground for green aphis, which is really the most serious pest of them all. These enemies may be readily destroyed in the seed-beds by applying a spray composed of a solution of arsenate of lead and nicotine concentrate, in dull weather when there is no wind. The ingredients are 2 oz. arsenate of lead paste, 3 teaspoonfuls of nicotine, and 4 gallons water. The danger from these attacks is greatest in a dry season.

During November garden swedes are usually sown. This is generally satisfactory in the cooler districts; elsewhere it is advisable to postpone the sowing until autumn.

In the cooler districts brussels sprouts are a valuable winter crop: they should be planted out about 30 in. apart during November in firm, well-settled ground that has been recently limed.

To keep the asparagus crop in good vigorous condition cutting must not be unduly prolonged. The middle of November is late enough to cease cutting even on well-established plantations; on four- and five-year-old plants cutting should cease two to four weeks earlier. To promote

good normal growth apply, when cutting ceases, a dressing of fertilizers or organic manures. Where the soil is light and inclined to be dry a part of the dressing may with advantage take the form of a mulch.

Sow dwarf and runner beans, sweet corn, cucumbers, marrows, pumpkins, and melons. Set out kumara plants.

### The Tomato Crops.

In the unheated glasshouse the tomato crop usually commences to ripen towards the end of November. The older leaves about the bottom bunch may then be trimmed off. These and all other trimmings should be taken out of the house and burnt. If the soil is inclined to dry out quickly a mulch may be laid to assist in retaining moisture. An application of liquid manure after watering may usually now be applied at intervals of a fortnight with advantage to help swell the fruit. If the mulch is not laid and cultivation is maintained, care should be taken to avoid going so deep as to disturb the fibrous roots, which at this stage are very near the surface. Keep the air in the house fresh and buoyant, and avoid cold draughts.

Where the early crop has been planted outside the plants will now be getting established; cultivation in fine weather, when the ground is dry, should be given promptly to destroy seedling weeds and break up the crust formed on the surface by recent rains. Plants for setting out for a late crop should be given plenty of air to induce sturdy growth. As soon as the weather settles they will do very well in the cradles, where the danger from overheating will not be so great as in the hot-bed under glass.

The size and quality of the crop will depend very much on the class of plant that is set out; if it is well developed, sturdy, and clean there is usually not much doubt about the result. Starved plants with a proportion of blind growths are likely to be diseased to some extent; they are a source of anxiety to the grower, and all the spraying and attention given can have but little result. These troubles are often largely due to the quality of the soil used in the seed-boxes.

For raising the seedling plants a fresh clean loam and a small amount of well-decayed manure to provide humus is required. The former is best obtained by taking the top spit from a fairly rich pasture and stacking it in a heap to decay. For the latter ingredient nothing is better than the manure from the hot-bed which has been well fermented and has now completed its work for the season. By stacking them now in alternate layers in a compact heap, and keeping the heap moist in dry weather, the material will decay and sweeten in time for use in the winter and spring when next season's seedlings are being raised. Where only moderate quantities are required the material is best stored in a specially constructed bin. The compost should be turned occasionally to ensure thorough decay and blending of the materials. This preparation should be commenced now, as ample time is necessary for these processes to take place satisfactorily. The turf from heavy land would be all the better if it were given two years in the stack to mature. Many crops would be improved by giving more attention to this operation.

### Small Fruits.

The gooseberry and strawberry harvest now open the season for fruit of this class. They are a welcome change to the stored fruit which has been in use during the winter and is now becoming scarce. By clean picking of all matured fruit, and packing a consistent standard grade, the crop will be sold to best advantage. The cooking and serving of these and other products of the orchard and garden often leave much to be desired, and a certain amount of advertising that included new and tasteful

recipes would no doubt do much to increase the sales. Comparatively few people know the correct season for these different fruits, or realize for what a brief period many of the best of them are available. Sentiment is now favourable to the patronage of local products, and as they are mostly of the highest quality, when properly harvested and packed, an effort should be made to put this excellent policy fully into practice.

**The Homestead Garden.**

Ever since the dahlia was introduced from Mexico in the 18th century it has been appreciated in gardens for the richness and brightness of its blossoms. Quite recently these, by selection, have been lifted well up above the plant on good stiff stems, which is such an improvement that the dahlia's popularity is greater than ever. In addition the range of colours has been increased, and it can be obtained in many forms both tall and dwarf. Planted now in a well-prepared herbaceous bed or border, about 4 ft. apart—wider or closer according to its growth—and grown on from one strong shoot, they should do well and make a fine display in autumn. Interplanting the foreground with summer flowering annuals is a good method for obtaining an early display.

The chrysanthemum is one of the finest contributions to our gardens from the East. A plant so responsive to attention is naturally a great favourite. Although a perennial herbaceous plant, it also is best replanted annually from rooted cuttings. These may be set out now under similar conditions to the dahlia. They have quite a long season of blooming; but the mid-season (autumn) flowering varieties are most popular. Pinch out the tip of the plant when setting it out and later reduce the ensuing growths to three. About the month of December each of these growths may be treated in the same way, and we then have nine shoots, which should be grown on for flowering. In a sheltered border and neatly staked the plants will well repay all the attention that is given them.

The display of dahlias or chrysanthemums will naturally depend very much on the selection and arrangement of colours. Instead of making as big a collection of varieties as possible, it is often best to plant groups, large or small, of one variety, thus obtaining a more restful and impressive effect.

Except for commercial culture, spring flowering bulbs do not require to be lifted at frequent intervals; but when they become crowded, or it is desired to rearrange them, it is necessary to do so. They should then be carefully marked when in flower and lifted as soon as the foliage turns yellow. They should be lifted at once as soon as this happens, as in many instances the period of rest is very short and growth quickly recommences. The time of lifting generally is about the end of November; the bulbs should then be taken up when the soil is dry, and spread for a few days in a shaded airy place to ripen. They should then be placed in shallow boxes, carefully labelled, and stored in a cool ventilated shed until replanted.

Seeds of biennial and perennial herbaceous plants may now be sown for planting out in the autumn. These include wallflowers, stocks, violas, pansies, primroses, campanula, aquilegias, &c. Sturdy plants set out in the autumn will make a good display during the following spring or summer.

*—W. C. Hyde, Horticulturist, Wellington.*

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*Registration of Horticultural Nurseries.*—In the official year 1932–33 the number of nurseries registered with the Department of Agriculture was 686, compared with 686 in the preceding year. Registration fees collected amounted to £684 10s.

# WEATHER RECORDS: SEPTEMBER, 1933.

Dominion Meteorological Office.

ANOTHER very good spring month was experienced in September. Reports generally indicate that the season so far has been the best for many years. Mild temperatures and an absence of strong winds have been important factors contributing to these favourable conditions.

*Rainfall.*—Rainfall was above normal from Auckland northwards, in the Wanganui and Manawatu districts, and in the extreme South. Elsewhere, however, not more than half the average was recorded. For much the greater part of the country, the accumulated deficit since the beginning of the year is assuming large proportions.

*Temperature.*—The month was on the whole a mild one, with few frosts. In eastern districts and the Bay of Plenty the mean temperatures were rather below average at many places, but in the interior and western districts the reverse was distinctly the case. During the last week or so there was a prevalence of cold southerly winds, and growth of vegetation was retarded, especially in the North Island. A frost on the 27th did some damage in the Bay of Plenty area.

*Sunshine.*—Sunshine appears to have been above normal almost everywhere. Of the records to hand, Napier's is the only one in which such is not the case. At Lake Tekapo a total of 227½ hours was experienced.

*Pressure Systems.*—There were few storms of much consequence during the month. The first was due to a depression of the westerly type, which passed between the 2nd and the 4th. Widespread rains were caused, but in general they were not heavy.

On the 7th a rather complex depression advanced across the Tasman Sea. A cyclone centre developed in the northern portion of this, and passing just north of New Zealand on the 10th, was followed by a secondary on the 11th. During this period, strong north-easterly winds were experienced. In Auckland Province, especially, strong gales occurred at many places. A considerable amount of damage was done, and shipping was delayed. The rain was confined principally to northern and north-eastern districts during the north-easterly blow, but before the whole storm system had passed on the 13th it had been almost general. Some flooding occurred in North Auckland and in the Thames and Waihou Rivers.

The most general rains, however, were associated with a series of westerly depressions which passed between the 18th and 21st. On the 19th and 20th there were northerly gales, particularly about the Cook Strait area. Many places recorded heavy rain, especially on the night of the 20th and the morning of the 21st.

There were light falls of snow on the ranges on the 12th and 21st, and in parts of the South Island also on the 24th.

From the 22nd onwards there was little storm activity, but cold southerly winds prevailed owing to disturbed conditions to the east of New Zealand.

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*Club-root Resistant Turnips.*—Reports received from a number of farmers who grew the Bruce turnip in Otago-Southland last season indicated that this variety is of exceptional merit, on account of its resistance to club-root and as a good cropper. The Wilhelmsburger Oftofte swede also showed decided club-root resistant power at the Gore Experimental Area.

RAINFALLS FOR SEPTEMBER, 1933, AT REPRESENTATIVE STATIONS.

| Station. | Total Fall. | Number of Wet Days. | Maximum Fall. | Average September Rainfall. |
|---|---|---|---|---|
| *North Island.* | | | | |
| | Inches. | | Inches. | Inches. |
| Kaitaia .. .. .. | 5·36 | 15 | 2·00 | 5·02 |
| Russell .. .. .. | 7·35 | 12 | 2·66 | 3·96 |
| Whangarei .. .. .. | 5·95 | 19 | 2·24 | 4·87 |
| Auckland .. .. .. | 4·43 | 17 | 0·99 | 3·71 |
| Hamilton .. .. .. | 1·71 | 10 | 0·65 | 4·41 |
| Rotorua .. .. .. | 2·58 | 10 | 0·76 | 5·13 |
| Kawhia .. .. .. | 2·16 | 10 | 0·81 | 4·67 |
| New Plymouth .. .. | 2·85 | 12 | 0·99 | 5·06 |
| Riversdale, Inglewood .. .. | 5·02 | 13 | 1·83 | 9·69 |
| Whangamomona .. .. | 3·96 | 6 | 1·92 | 7·32 |
| Hawera .. .. .. | 2·85 | 10 | 1·15 | 3·61 |
| Tairua .. .. .. | 3·74 | 9 | 0·84 | 4·81 |
| Tauranga .. .. .. | 2·61 | 12 | 0·73 | 4·39 |
| Maraehako Station, Opotiki .. | 2·66 | 11 | 0·78 | 4·31 |
| Gisborne .. .. .. | 3·48 | 12 | 1·08 | 2·98 |
| Taupo .. .. .. | 1·00 | 10 | 0·58 | 3·89 |
| Napier .. .. .. | 1·18 | 10 | 0·38 | 2·22 |
| Hastings .. .. .. | 1·54 | 11 | 0·65 | 2·55 |
| Whakarara Station, Kereru .. | 3·37 | 14 | 0·84 | .. |
| Taihape .. .. .. | 1·48 | 11 | 0·71 | 3·23 |
| Masterton .. .. .. | 2·43 | 14 | 0·62 | 3·06 |
| Patea .. .. .. | 3·85 | 10 | 1·20 | 3·68 |
| Wanganui .. .. .. | 3·97 | 9 | 1·50 | 2·91 |
| Foxton .. .. .. | 2·84 | 7 | 0·90 | 2·49 |
| Wellington .. .. .. | 2·97 | 14 | 0·64 | 3·11 |
| *South Island.* | | | | |
| Westport .. .. .. | 3·29 | 13 | 0·87 | 8·30 |
| Greymouth .. .. .. | 4·28 | 13 | 1·03 | 8·18 |
| Hokitika .. .. .. | 5·69 | 10 | 1·57 | 9·21 |
| Ross .. .. .. .. | 5·93 | 10 | 1·96 | 12·77 |
| Arthur's Pass .. .. .. | 6·66 | 8 | 2·80 | 14·97 |
| Okuru .. .. .. | 5·78 | 7 | 2·60 | 12·21 |
| Collingwood .. .. .. | 8·16 | 14 | 2·62 | 9·67 |
| Nelson .. .. .. | 2·80 | 8 | 0·97 | 3·69 |
| Spring Creek .. .. .. | 1·38 | 8 | 0·70 | 2·67 |
| Hanmer Springs .. .. | 2·02 | 12 | 0·53 | 4·65 |
| Highfield, Waiau .. .. | 0·58 | 5 | 0·16 | 3·03 |
| Gore Bay .. .. .. | 1·00 | 6 | 0·64 | 3·02 |
| Christchurch .. .. .. | 1·41 | 10 | 0·47 | 1·74 |
| Timaru .. .. .. | 0·68 | 3 | 0·53 | 1·94 |
| Lambrook Station, Fairlie .. | 1·41 | 4 | 0·73 | 2·20 |
| Benmore Station, Clearburn .. | 0·90 | 4 | 0·62 | 1·95 |
| Oamaru .. .. .. | 0·48 | 6 | 0·21 | 1·66 |
| Queenstown .. .. .. | 0·36 | 7 | 0·22 | 2·57 |
| Clyde .. .. .. .. | 0·27 | 2 | 0·24 | 1·05 |
| Dunedin .. .. .. | 2·19 | 13 | 0·66 | 2·75 |
| Wendon .. .. .. | 2·67 | 11 | 0·95 | 2·47 |
| Gore .. .. .. .. | .. | .. | .. | 2·84 |
| Invercargill .. .. .. | 4·70 | 19 | 1·52 | 3·27 |
| Puysegur Point .. .. | 7·10 | 21 | 1·65 | 6·54 |
| Half-moon Bay .. .. | 3·59 | 15 | 1·43 | 5·24 |

# SEED CERTIFICATION CHARGES: AMENDED SCALE ADOPTED.

IT has been decided to amend the scale of charges made in connection with the seed certification scheme conducted by the Department of Agriculture as follows :—

(NOTE.—The term "line" when used in connection with the machine-dressing charges refers to all that lot of seed covered by any one purity and germination certificate.)

## A. Scale of Charges.

### 1. GRASS AND CLOVER SEED.

*(a) Rye-grass and Cocksfoot :—*

(i) Entrance fee : 10s., payable with application.

(ii) Excess-area fee : The entrance fee covers the first 10 acres. An excess-area fee of 1s. must be paid for each acre passed in excess of 10 acres. This fee is payable on acceptance of the produce of the area as of certification standard and before paddock-sealing is undertaken. If not paid within sixty days of acceptance no further action will be taken in regard to the produce from the area.

(iii) Machine-dressing fee : 1½d. per bushel or part bushel of machine-dressed seed. The charge thus made on any one line must not be less than the amount computed at the rate of 6d. per sack or part sack.

*(b) Clover :—*

(i) Entrance fee : As in rye-grass and cocksfoot.

(ii) Excess-area fee : As in rye-grass and cocksfoot.

(iii) Machine-dressing fee : 1d. per 10 lb. (or part thereof) of machine-dressed seed. The charge thus made on any one line must not be less than the amount computed at the rate of 3d. per sack or part sack, with a minimum of 2s. 6d. for each visit made for the purpose of sealing.

*(c) Brown-top :—*

(i) Entrance fee : As in rye-grass and cocksfoot.

(ii) Excess-area fee : The entrance fee covers the first 200 acres. An excess-area fee of 1s. must be paid for each 100 acres (or part thereof) in excess of 200 acres. This fee is payable on acceptance of the area. If not paid within sixty days of acceptance no further action will be taken in regard to the produce from the area.

(iii) Machine-dressing fee : As in clover.

### 2. WHEAT.

(i) Entrance fee : As in rye-grass and cocksfoot.

(ii) Excess-area fee : As in rye-grass and cocksfoot, except that it is payable within sixty days after demand and before grain is passed or any sealing of bags is undertaken.

(iii) Machine-dressing fee : ½d. per bushel or part bushel.

### 3. POTATOES.

(i) Entrance fee : As in rye-grass and cocksfoot.

(ii) Inspection fee : 10s. payable before 15th December, otherwise no inspection of the crop will be made and the application will lapse, no further action being taken by the Department in connection therewith.

(iii) Excess-area inspection fee : The inspection fee covers the first 5 acres. An excess-area fee of 2s. 6d. must be paid for each acre in excess of 5 acres. The excess area is determined at time of inspection, and the fees in respect thereof must be paid within sixty days of determination, otherwise the application will lapse and the Department will take no further action in the matter.

**B. General Conditions.**

1. In every case, whenever a fee is due no further action will be taken by the Department until such fee is paid.

2. The entrance fee for any crop covers all entries of that crop made by any one grower on the one farm. The acreage for the purposes of charging is taken as the total acreage of any one crop entered by one grower on one farm, irrespective of whether this is in one or more paddocks.

COLLECTION OF FEES.

3. (*a*) The grower is responsible for the payment of all certification fees except the machine-dressing fees, which are payable by the merchant doing the machine-dressing.

(*b*) The machine-dressing fees are payable by the merchant doing machine-dressing, and monthly accounts will be sent out.

4. (*a*) If neither field inspection nor paddock sealing is necessary, only the entrance fee is payable, and no excess area fee will be charged.

(*b*) If either field inspection or paddock sealing is necessary (or if both are necessary), then both entrance fee and excess-area fee are payable.

5. (*a*) If a grower enters more than one kind of seed for certification, then on each kind the charges will be computed separately, except as in (*b*) and (*c*) below.

(*b*) In the case of two kinds of seed being harvested together—*e.g.*, white clover (eligible for certification) separated from certified rye-grass at threshing-time—the entrance fee and the excess-area fee on the one kind of seed also covers the second kind, and machine-dressing fees only on both will be payable.

(*c*) Similarly in the case of seeds dressed out at machine-dressing and being eligible for certification—*e.g.*, white clover dressed out of certified rye-grass—machine-dressing charges only are payable for the second kind of seed.

(*d*) If any area is rejected at field inspection, no excess-area fee is payable, except in the case of potatoes, where the excess-area fee covers part of the cost of making the inspection.

MACHINE-DRESSING CHARGES FOR BLENDING, REDRESSING, AND SPLITTING.

6. (*a*) Charges for sealing and tagging will be made at the time when a sample is drawn for the purity and germination certificate, except that no charge will be made for resampling sealed sacks for the purpose of a fresh purity and germination certificate.

(*b*) A charge will therefore be made at standard rates for resealing and retagging certified seed which is opened for the purpose of redressing, blending, or splitting, with a minimum charge of 2s. 6d. for each occasion that an officer's services are required for this purpose.

(*c*) There will be no charge made for the sealing of machine-dressed seed which is being held temporarily with the object of blending (as may often occur in the case of brown-top) until such time as the blended seed is finally sealed and tagged and sampled for a purity and germination certificate.

—*Fields Division.*

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*Improvement in Wool Packs.*—The Annual Report of the Empire Marketing Board for 1932–33 makes the following reference to this matter: "The search for a suitable medium for the manufacture of wool packs free from surface hairs which might penetrate into the wool has continued. The continuation of the earlier work upon paper packs was temporarily postponed in order to consider the possibility of rendering ordinary jute packs innocuous by means of suitable impregnation. Cellulose and rubber-treated packs have been sent to Australia and returned filled with wool. Whilst considerable progress was attained, there remain many factors to be further considered. The question seems to be largely resolving itself into one of economics, since an increase in the price of the pack must, if at all necessary, be very small. This proviso limits the field of activity greatly, but it is hoped that this year the Dominion tests will again indicate a considerable amount of further progress towards the attainment of the object in view."

# NUMBER AND CLASSIFICATION OF SHEEP IN NEW ZEALAND AS AT 30th APRIL.

## TABLE I.—SUMMARY BY SHEEP DISTRICTS, 1933.

| Class. | Auckland. | Napier-Gisborne. | Wellington-West Coast. | Marlborough-Nelson-Westland. | Canterbury-Kaikoura. | Otago (including Southland). | Total in Dominion. |
|---|---|---|---|---|---|---|---|
| Stud rams (entered in flock-book) | 1,309 | 1,111 | 3,421 | 532 | 3,238 | 3,742 | 13,353 |
| Other rams .. .. .. | 47,726 | 104,232 | 95,336 | 19,630 | 88,571 | 94,771 | 450,266 |
| Wethers .. .. .. | 267,250 | 386,811 | 439,762 | 218,724 | 461,488 | 641,148 | 2,415,183 |
| Breeding-ewes .. .. | 1,783,450 | 3,943,718 | 3,591,773 | 767,867 | 3,396,693 | 3,726,196 | 17,209,697 |
| Dry ewes .. .. .. | 97,804 | 211,029 | 177,204 | 71,956 | 181,545 | 259,348 | 998,886 |
| Lambs .. .. .. | 642,720 | 1,826,927 | 1,332,446 | 317,797 | 1,059,848 | 1,488,843 | 6,668,581 |
| Totals, 1933 .. | 2,840,259 | 6,473,828 | 5,639,942 | 1,396,506 | 5,191,383 | 6,214,048 | 27,775,966 |
| Totals, 1932 .. | 2,992,354 | 6,280,928 | 5,673,705 | 1,448,903 | 5,638,714 | 6,657,184 | 28,691,788 |

## TABLE II.—COMPARATIVE STATEMENT: TEN YEARS, 1924–33.

| Year. | Stud and Flock Rams. | Stud Breeding-ewes. | Stud Dry Ewes. | Stud Lambs. | Total Stud Sheep and Flock Rams. | Sheep of Distinctive Breed not entered in Flock-books, and Crossbred Sheep. | | | | Grand Total, Stud and other Sheep. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Wethers. | Breeding-ewes. | Dry Ewes. | Lambs. | |
| 1924 .. .. | 332,814 | 179,533 | 9,727 | 132,137 | 654,211 | 2,807,832 | 12,896,561 | 1,036,723 | 6,381,249 | 23,775,776 |
| 1925 .. .. | 355,579 | 184,744 | 7,867 | 131,485 | 679,675 | 3,063,663 | 13,530,479 | 875,899 | 6,398,239 | 24,547,955 |
| 1926 .. .. | 370,535 | 192,055 | 10,053 | 138,526 | 711,169 | 3,212,435 | 13,756,197 | 1,069,682 | 6,155,510 | 24,904,993 |
| 1927 .. .. | 388,274 | 199,219 | 8,644 | 144,897 | 741,034 | 3,074,974 | 14,632,511 | 823,047 | 6,377,450 | 25,649,016 |
| 1928 .. .. | 396,351 | 205,720 | 7,347 | 145,969 | 755,387 | 3,024,647 | 15,328,331 | 861,780 | 7,163,653 | 27,133,810 |
| 1929 .. .. | 422,331 | 219,802 | 7,203 | 156,526 | 805,862 | 3,289,135 | 16,388,353 | 875,495 | 7,692,537 | 29,051,382 |
| 1930 .. .. | 448,617 | 244,480 | 7,884 | 174,862 | 875,843 | 3,367,916 | 17,319,695 | 1,069,788 | 8,208,045 | 30,841,287 |
| 1931 .. .. | 461,998 | 238,281 | 8,081 | 169,879 | 878,239 | 3,429,552 | 17,370,448 | 1,202,633 | 6,911,644 | 29,792,516 |
| 1932 .. .. | 469,051 | 232,006 | 7,855 | 164,750 | 873,662 | 2,730,826 | 16,831,054 | 1,260,323 | 6,995,923 | 28,691,788 |
| 1933 .. .. | 463,619 | 226,330 | 6,625 | 160,265 | 856,839 | 2,415,183 | 16,983,367 | 992,261 | 6,508,316 | 27,755,966 |

# ANSWERS TO INQUIRIES.

**IN order to ensure reply to questions, correspondents must give their name and address, not necessarily for publication, but as a guarantee of good faith. Letters should be addressed to the Editor.**

USE OF CAUSTIC STICK FOR HORN SUPPRESSION ON CALVES.

"SUBSCRIBER," Tutira :—

Please inform me how to use the caustic stick on calves for prevention of horn growth, and what age the calves should be.

The Live-stock Division :—

To be effective the caustic stick must be used a few days after the calf is born, when the horn button is making its way through the skin. The hair should be clipped from the part, then damped with water, and the stick applied on the button and for some little distance from its base, so that all horn growing tissue is destroyed. At the same time care should be taken that the caustic does not run to other parts, as it will injure the skin. When the caustic stick is applied it is advisable to obtain a holder so as to protect the operator's fingers and hands.

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THE CARROT CROP FOR SHEEP-FEEDING.

A. T. R., Wairoa, H.B. :—

Kindly advise me as to the best variety of field carrots to sow for feeding off by sheep in April or May. Which month would you recommend for sowing, how much seed per acre, distance between rows, and whether inter-row cultivation would be beneficial? I presume that thinning would not be necessary.

The Fields Division :—

The variety most popular for feeding off by sheep is the Guerande, principally because it requires the least attention and is a good yielder, and hence the lowest in production costs. Many crops of this variety entered in the Farmers' Field Competitions have weighed out at well over 40 tons per acre. It is suggested that you sow 2 lb. of seed per acre in 14 to 21 in. drills, as this practice is giving good results in other districts. It should be remembered that the carrot crop, like other root crops, is a heavy feeder, and therefore a liberal application of manure is always a payable proposition. Inter-row cultivation is a necessity, otherwise weed growth may either smother completely or at least considerably lessen the yield of the crop. From 3 cwt. to 5 cwt. per acre of a mixture of equal quantities of super and blood and bone at time of sowing, and where possible a heavy application of farmyard manure prior to ploughing, is giving good results. The Guerande type of carrots should not be thinned.

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AGE FOR CASTRATING A COLT.

J. B., Levin :—

Could you please inform me at what age it is best to castrate a colt? The colt I have in mind is a three-quarter draught and about a year old.

The Live-stock Division :—

The yearling colt may be castrated at any time on a cool day in the spring months. If not castrated now it is advisable to leave the operation until the cooler autumn weather. Extremes of weather are to be avoided. Some owners prefer to leave a colt until two years of age before carrying out the operation. By so doing it is claimed that the colt develops more masculine character and reaches maturity at an earlier age. On the other hand, the colt at this age often becomes troublesome, especially when other horses are being kept on the same or neighbouring properties. An owner must therefore decide to suit his own requirements. The colt can be castrated at two years of age, provided the owner has no objections to leaving him in the meantime. It is advisable to leave a weak or weedy colt until the autumn or until he reaches two years of age.

### KILLING OLD WILLOW TREES.

"WILLOWS," Akaroa :—

Would you please tell me an effective method of killing old willow-trees? I do not wish to chop them down.

The Horticulture Division :—

Old willow-trees may be killed, without chopping them down, by boring auger holes in a downward sloping direction in the trunk, filling the holes with any good weed-killer, and plugging them to prevent evaporation.

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### BLUESTONE DRENCH FOR STOCK.

W. J. BURTON, Kerepeehi :—

We have trouble with scours in cows and young stock in this district during the early spring and autumn, which undoubtedly is caused by a parasite. I drench with bluestone and find it very effective; but is it advisable to use this often, for some cows require frequent treatment?

The Live-stock Division :—

We would advise you to continue the bluestone (copper sulphate) treatment and drench every month, for as long as you like. It would be advisable to give your stock supplementary food such as good hay, bran, crushed oats, &c., if they will take it, and always have rock salt for them to partake of. Any part of the farm that is swampy should be attended to as regards drainage, or be fenced off so that the stock do not get access to it.

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### DESTRUCTION OF WOOD-LICE.

"SUBSCRIBER," Marton :—

Will you kindly give me a remedy or suggestions for the destruction or control of wood-lice in the garden?

The Horticulture Division :—

The most effective bait is composed of 1 lb. of Paris green and 28 lb. of bran, thoroughly mixed and distributed thinly, especially under boxes of seedlings in a dry state, towards the end of an afternoon.

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## KILLINGS AT MEAT-EXPORT WORKS.

THE following table, compiled from Meat Producers Board statistics, gives particulars of aggregate killings and/or equivalent output at meat-export works in New Zealand for the past five years ended 30th September :—

| Year ended 30th September, | Beef Quarters. | Mutton Carcasses. | Lamb Carcasses. | Pork Carcasses. | Boned Beef = Freight Carcasses. | Sundries = Freight Carcasses. | Total Equivalent in 60 lb. Freight Carcasses. |
|---|---|---|---|---|---|---|---|
| 1928–29 | 151,115 | 1,751,979 | 5,971,557 | 159,297 | 161,597 | 153,331 | 6,152,695 |
| 1929–30 | 177,379 | 2,621,275 | 6,925,859 | 133,591 | 194,311 | 229,673 | 7,506,227 |
| 1930–31 | 143,169 | 2,132,532 | 7,783,528 | 132,400 | 266,315 | 307,461 | 7,358,865 |
| 1931–32 | 186,530 | 2,872,860 | 8,804,889 | 152,877 | 340,337 | 290,614 | 8,682,588 |
| 1932–33 | 427,610 | 2,010,159 | 8,794,906 | 323,980 | 438,236 | 376,972 | 9,248,497 |